4th
International Conference on Education
Proceedings

Theme: Building Capacity Through Quality Teacher Education

July 14-16, 2015
Nairobi, Kenya

Editors
Dr. Adelheid M. Bwire
Mr. Manuel S. Nyagisere
Prof. Joanna O. Masingila
Prof. Henry O. Ayot

KENYATTA UNIVERSITY
SYRACUSE UNIVERSITY

Proceedings of the 4th International Conference on Education

Building Capacity Through Quality Teacher Education

Nairobi, Kenya
July 14-16, 2015

Editors
Dr. Adelheid M. Bwire
Mr. Manuel S. Nyagisere
Prof. Joanna O. Masingila
Prof. Henry O. Ayot

Citation

Bwire, A. M., Nyagisere, M. S., Masingila, J. O., & Ayot, H. O. (2015). *Proceedings of the 4th International Conference on Education*. Nairobi, Kenya: Kenyatta University

Preface

Kenyatta University and Syracuse University have had an institutional linkage since 2000. This conference is one of the activities sponsored through the Kenyatta University-Syracuse University partnership.

These proceedings are a written record of the research presented at the International Conference on Education held July 14-16, 2015 at the Kenyatta University Conference Centre, Nairobi, Kenya. The theme of the conference, *Building Capacity Through Quality Teacher Education*, focused on important issues related to building capacity in teacher education. Other educational issues were also addressed through researchers' contributions at the conference.

TABLE OF CONTENTS

OPPORTUNITIES AND CHALLENGES: INTEGRATION OF ICT IN TEACHING AND LEARNING MATHEMATICS IN SECONDARY SCHOOLS, NAIROBI, KENYA

Sheila Amuko
Kenyatta University
Oyeila2014@gmail.com

Marguerite Miheso-O'Connor
Kenyatta University
miheso.marguerite@ku.ac.ke

Sophie Ndeuthi
Kenyatta University
ndethiu.sophia@ku.ac.ke

This presentation is based on a larger study whose purpose was to explore the various opportunities and challenges influencing integration of ICT in teaching and learning Mathematics in secondary schools in Nairobi County. The study, adopted a descriptive survey design. Three instruments questionnaires', a structured interview schedule and an observation checklist. The study was carried out in twelve public secondary schools in Nairobi County. Data was analysed using descriptive statistics. Findings from the study indicated that, teachers face major challenges such as developing their own technological skills and knowledge as well as self-training in the use ICTs in their teaching. This lack of capacity building support was found by the study to contribute to teacher lax in integrating technology in their teaching inspite of the enthusiasm. This study recommends that new frontiers on technology integration be made accessible to both teachers and students for learning purpose to increase access to information and that, capacity building in technology integration be increased for teachers and awareness be built among pre-service teachers trainees integrating ICT in teaching and learning Mathematics.

Keywords: ICT, School and Teacher Challenges, Teaching and Learning Mathematics.

Introduction

In Kenya Mathematics is a compulsory subject in secondary schools. Due to its importance the government is committed in ensuring the provision of high quality Mathematics education. The government of Kenya through the Ministry of Education and Kenya Institute of Curriculum Development has come up with e-learning materials. Effectively introducing technology into schools is also largely dependent upon the availability and accessibility of ICT resources (e.g. hardware, software and communications infrastructure). Technology is essential in teaching and learning mathematics; it influences the Mathematics that is taught and enhances students' learning. There are several benefits of using ICT in teaching and learning Mathematics. ICT has the potential to transform the nature of education; improving teacher's design work, enhancing the roles of students and teachers in the learning process and helping to create a collaborative learning environment (Khan, Hossain, Hasan and Clement, 2012). However there are challenges and opportunities that hinder greatly the integration of ICT in teaching and learning Mathematics in secondary schools.

Opportunities and Challenges in Integration of ICT

The growth of information and communication technologies (ICT) has dramatically reshaped teaching and learning processes. Mathematics teachers are faced with inhibiting challenges or barriers to computer use (Hudson and Porter, 2010). For this reason, there have been several studies that have specifically focused on ICT integration in secondary Mathematics teaching. Drent and Meelissen (2008); Ottenbreit-Leftwich, Glazewski, Newby and Ertmer, (2010); Tsai and Chai (2012); and Wachira and Keengwe (2011) describe two types of barriers, currently hampering the integrated use of ICT by teachers:- external (first order) barriers and internal (second order) barriers.

Kipsoi, Chang'ach and Sang (2012) observe that policy makers in Kenya continue to introduce strategies for ICT, with the intention of increasing its use in secondary schools. These strategies are likely to have an effect on the school level factors. The teacher level obstacles are more difficult for policy makers to tackle as it is the teachers themselves who need to bring about the required changes in their own attitude and approach to ICT. Stigler and Hiebert (2009) in their research findings stated that, the main factor in front of Mathematics integration process is the gap between the curriculum's expectations and teachers' beliefs. However, Gao, Tan, Wang, Wong and Choy (2011) suggested that, the integration of ICT into the Mathematics classroom depends on individual teachers as well as the schools' contextual factors.

Teacher related, challenges impact on fundamental change and are typically rooted in teachers' core beliefs and are therefore the most significant and resistant to change. Fullan (2007)**.** Teachers related factors refer to teacher comfortability, teacher confidence and teacher competence. Research indicates that lack of teachers' confidence prevents teachers from using ICT in their teaching (Peeraer and Van Petegem, 2011). Similarly Balanskat, Blamire and Kefala (2006) indicated that limitation in teachers ICT knowledge makes them feel anxious about using ICT in the classroom and thus not confident to use it in their teaching.

Teachers' computer competence is a major predictor of integrating ICT in teaching. Evidence suggests that majority of teachers who reported negative or neutral attitude towards the integration of ICT into teaching and learning processes lacked knowledge and skills that would allow them to make an "informed decision" (Bordbar, 2010). A study conducted by Agyei and Voogt (2012) in Ghana among pre-service and in-service Mathematics teachers, reported low levels of ICT integration levels as a result of low competencies and access levels of ICT. Successful integration of ICT in teaching is related to teachers' competence and also their attitudes towards the use of modern technology in their teaching and learning Ayub, Bakar and Ismail (2012).

Positive attitudes towards computer use by school teachers are important to ensure the integration of the technology is effectively carried out in the school curriculum and also during teaching and learning (Buabeng-Andoh, 2012) . Teachers' attitudes are influenced by their perception of the usefulness of ICT, their behaviour intentions and pedagogical aspects (Ayub et al., 2012) . Teachers' attitudes towards using ICT in teaching and learning are also influenced by several factors.

In teaching and learning of Mathematics, teachers' beliefs about Mathematics learning with or without using technology are considered to be important because it could influence teaching and learning, and curriculum reform (Güven, Çakiroğlu and Akkan, 2009) . At the classroom level, teachers' beliefs can accelerate or slow down curriculum reforms as teachers' beliefs are resistant to change and play a role in teaching practices (Boaler, 2013). Findings from a study done in Kenya by (Kukali, 2013) has shown that teachers who begin using ICT in their teaching, initially believe that technologies creates more work for them. In addition,(Güven et al., 2009) found that, Turkish Mathematics teachers have negative beliefs about using computers in Mathematics teaching because of negative experiences; however, they expressed that these beliefs can be changed with in-service and out-of-service courses focusing on long-term constructivist approach.

School related challenges refer to inadequate provided resources such as infrastructure, support, trainings and time. In Kenya, teachers rated lack of time as one of the most problematic factor to technology utilization in schools. They further said that mastering technology requires time (Kukali, 2013). Breakdown of a computer causes interruptions and if there is lack of technical assistance, then it is likely that the regular repairs of the computer will not be carried out resulting in teachers not using computers in teaching. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since no one would give them technical support in case there is technical problem (Buabeng-Andoh, 2012).

A study, in New Zealand and Australia conducted by Hudson and Porter (2010), found that, one of the barriers that Mathematics teachers identified in failing to adopt the use of computers in the classroom, is the lack of computer use is due to lack of experience, lack of adequate professional training and lack of professional support in the use of computers in Mathematics instruction. Successful use of technology for the benefit of children depends on the knowledge of teachers and their confidence and competence in using technology. So not only do teachers need to learn how to use technology, they also need to learn how to apply the technology to teaching and learning. In addition, they need to know which technologies will most effectively meet children's skills, abilities and needs (Girgin, Kurt, and Odabasi, 2011).

Research Objective

The purpose of this study was to examine the challenges and opportunities to ICT use in teaching and learning Mathematics in secondary schools. Specifically, this research focused on school related and teacher related challenges and opportunities towards ICT in teaching and learning Mathematics.

Methodology

This research used descriptive survey design and data collection was conducted on twenty-four Mathematics teachers from twelve secondary schools in Nairobi County. Purposive sampling was used to select teachers from the twelve schools. For this purpose the researcher developed a questionnaire, an interview schedule and an observation checklist that was piloted in a school was not included in the study. Two educational lecturers validated the instruments. Reliability test was done using Cronbach alphaα. Cronbach's alpha α coefficient was used to measure interval consistency of challenges and opportunities influencing integration of ICT in teaching and learning Mathematics. Data analysed was guided by the research objective. Data code sheets were created from those instruments then keyed into the statistical package for social science (SPSS) computer package. Qualitative data was grouped into similar themes in line with the research questions. Quantitative data was analysed using descriptive statistics like frequencies, mean and percentage.

Results of the Findings

ICTs infrastructures, training and seminars are costly and financial plans are essential for secondary schools to catch up with rapid changes and improvement in hardware, software and networks. This study established to find out the contributing opportunities and challenges that influenced integration of ICT in teaching and learning Mathematics from the respondents. The findings are presented in Table 1.1

Table 1.1: Opportunities and Challenges of ICT Use in Mathematics

	Responses % N=24			
Opportunities and Challenges in Integration of ICT in Teaching and Learning Mathematics	**S/A**	**A**	**D**	**S/D**
a) Mathematics teachers lack technical support regarding ICT integration.	17	41	17	25
b) There is inadequate time to integrate ICT in teaching Mathematics curriculum.	42	16	-	42
c) Schools are not interested in integrating ICT in Mathematics curriculum, because they lack competent and confident teachers.	08	09	42	41
d) Lack of training opportunities for ICT integration in teaching and learning Mathematics.	18	46	18	18
e) Mathematics teachers' lack of ICT skills and Knowledge.				
f) Mathematics teachers lack support from the school administration.	18	45	09	28
g) Mathematics teachers lack experience in using computers.				
h) Inadequate ICT infrastructure for teaching and learning	18	46	27	18
Mathematics.	09	46	27	18

Notably, two fifth of the respondents agreed that Mathematics teacher's lacked technical support in regards to ICT integration. Two fifth of the respondents strongly agreed that the current Mathematics curriculum does not allow enough time to integrate ICT in teaching. At least four ninth of the respondents strongly disagreed that schools are not interested in integrating ICT in the Mathematics curriculum, because they lack competent teachers and confident teachers. From the interview schedule two fifth of the Head of Department mentioned that teachers in their schools haven't fully embraced the use of ICT in teaching Mathematics due to limited resources and lack of confidence. Half of the respondent agreed that Mathematics teachers lacked training opportunity for ICT integration and knowledge acquisition in teaching and learning Mathematics. In addition, Mathematics teachers' lack of support from the school administration was agreed by half of the respondents. Lack of ICT skills and knowledge in Mathematics was agreed by half of the respondents. Finally two fifth of the respondents indicated that there was lack of adequate ICT infrastructure in teaching and learning Mathematics.

Similarly students revealed that at most a quarter of the students agreed that they had very large computer labs with very many functional computers that could cater for students needs in the school. Three quarters of the students indicated that there was inadequate ICT infrastructure in their schools, with reasons given for this including the following. The calculators that they were using didn't belong to the school, but there were own personal belongings. Computers were not enough and majority of the ones available were not in use due to technical problems causing them to use the functioning ones in shifts. Students had to overcrowded on one computer making learning difficult for them (it affected their concentration). They also lacked smart boards and projectors; and most of the computers were not connected to the Internet. Findings reveal that Mathematics teachers are not adequately prepared to handle ICT infrastructure's in Mathematics lessons.

ICT Facilities for Learning Mathematics

The effective use of ICT in teaching and learning Mathematics motivates both the learners and the teachers. This study sought to identify the conditions of ICT facilities for learning Mathematics in the schools as shown in Figure 1.1 below.

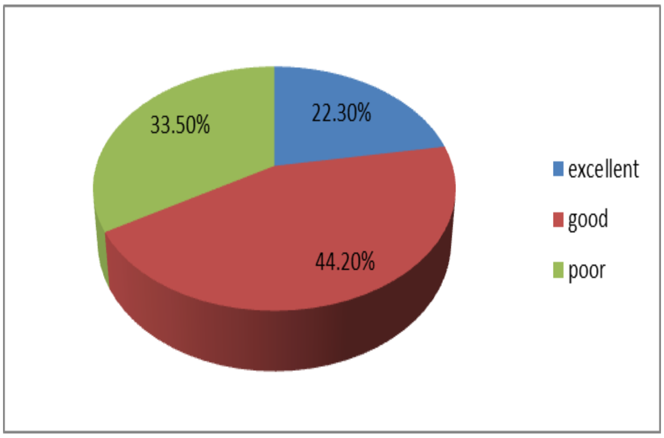


Figure 1.1: ICT Facilities for Learning Mathematics.

The study revealed that one fifth of the students considered that utility of ICT facilities in the school were excellent, while four ninth of the students indicated that the utility of ICT facilities was good. Finally a third of the students rated the use of ICT facilities in their school as poor. The study revealed that most secondary schools used ICT facilities during Mathematics lessons.

Effective Use of Mathematics software

Training enables teachers to acquire knowledge and skills on how to use Mathematics' software effectively. This study established to find out from students whether their Mathematics teachers used Mathematics software effectively as shown in Figure 1.2 below.

Use of the Internet in Performing of Mathematics Task

Students have good general ICT skills, although they do not get the same advantage from using online resources. This study was interested in finding out if the use of Internet contributes to their learning and performance of Mathematics task as shown in Figure 1.2 below.

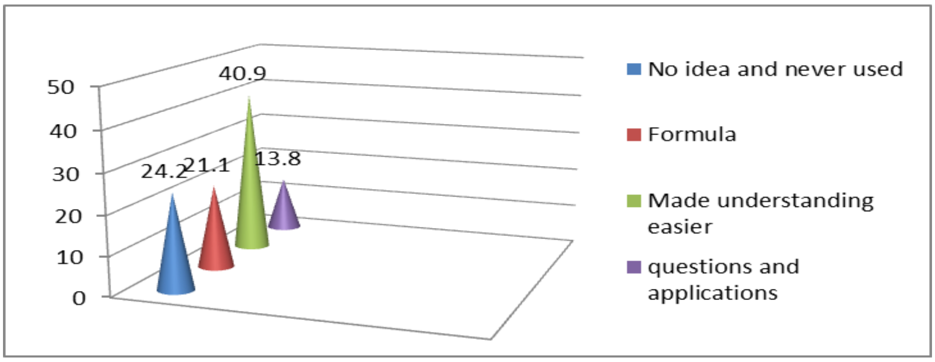


Figure 1.2: Use of Internet in Performing Mathematics Task.

Figure 1.2 indicates that nearly a quarter of the students did not have any idea because they never used the Internet during Mathematics lesson this shows that that this students did not have access to the Internet. One fifth mentioned that internet assisted them in getting formulae which they were not familiar with while two fifth mentioned that the internet made their understanding easier, while the use of internet to search for questions and application in Mathematics was mentioned by nearly one sixth of the students. The study reveals that most students have access to the Internet during Mathematics lessons.

Challenges in Learning both Mathematics Content and Computer Technology

Difficulties in the use of ICTs and Mathematics software are related to the weakness of a teacher's knowledge about what technologies are available and how they can be used during learning Mathematics. This was to establish the challenges in learning both Mathematics content and computer technology, as shown in Figure 1.3 below.

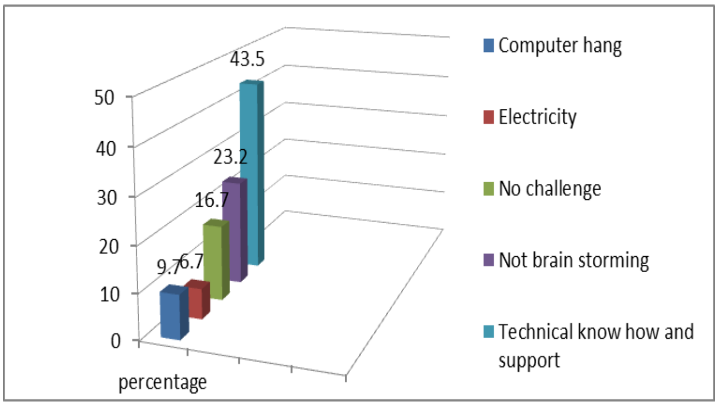


Figure 1.3: Challenges in using ICT in Learning Mathematics and Technology.

The major challenge students experienced was lack of technical know-how and support while learning Mathematics with ICT, it was mentioned by four ninth of the students. This result indicates that students were willing to use ICT but lacked technical support from the teachers. Learning with ICT was not brain storming and that this affected their way of thinking and reasoning was mentioned by a quarter of the students, they further indicated that when using ICT in learning it only gave them one answer.

In addition, nearly one tenth indicated that most of the computers hang and this caused students to overcrowd on one computer while, at least one twelfth indicated electricity was a challenge because it caused power surge, rendering computers useless and also inconvenienced their learning, one sixth mentioned that they experienced no challenge since they never used computers during Mathematics lessons. This shows that there are some students who cannot access computers at all or they cannot operate computers due to negative attitude towards ICT infrastructures.

References

Agyei, D. D., & Voogt, J. (2012). Developing Technological
Pedagogical Content Knowledge in Pre-Service Mathematics Teachers through Collaborative Design. *Australasian Journal of Educational Technology*, *28*(4), 547–564.

Al-Senaidi, S., Lin, L., & Poirot, J. (2009). Barriers to Adopting
Technology for Teaching and Learning in Oman. *Computers & Education*, *53*(3), 575–590.

Ayub, A. F. M., Bakar, K. A., & Ismail, R. (2012). Relationships
between School Support, School Facilities, ICT Culture and Mathematics Teachers' Attitudes towards ICT in Teaching and Learning. In *THE 5TH INTERNATIONAL CONFERENCE ON RESEARCH AND EDUCATION IN MATHEMATICS: ICREM5* (Vol. 1450, Pp. 196–200 AIP Publishing. Retrieved From Http://Scitation.Aip.Org.

Bingimlas, K. A. (2009). Barriers to the Successful Integration of ICT in
Teaching and Learning Environments: A Review of the Literature. *Eurasia Journal of Mathematics, Science & Technology Education*, *5*(3). Retrieved from Http://Search.Ebscohost.Com.

Boaler, J. (2013). *Experiencing School Mathematics: Traditional and
Reform Approaches to Teaching and their Impact on Student Learning*. Routledge. Retrieved from Http://Books.Google.Com.

Bordbar, F. (2010). English Teachers' Attitudes Toward Computer-Assisted
Language Learning. *International Journal of Language Studies*, *4*(3). Retrieved from Http://Search.Ebscohost.Com.

Buabeng-Andoh, C. (2012). An Exploration of Teachers' Skills, Perceptions and Practices of ICT in Teaching and Learning in the Ghanaian Second-Cycle Schools. *Contemporary Educational Technology*, *3*(1). Retrieved from Http://Search.Ebscohost.Com.

Dionys, D. (2012). Introduction of ICT and Multimedia into Cambodia's Teacher Training Centres. *Australasian Journal of Educational Technology*, *28*(6), 1068–1073.

Drent, M., & Meelissen, M. (2008). Which Factors Obstruct or Stimulate Teacher Educators to Use ICT Innovatively? *Computers and Education*, *51*(1), 187–199.

Fullan, M. (2007). *The New Meaning of Educational Change*. Routledge. Retrieved from Http://Books.Google.Com.

Gao, P., Tan, S. C., Wang, L., Wong, A., & Choy, D. (2011). Self-Reflection and Pre-service Teachers' Technological Pedagogical Knowledge: Promoting Earlier Adoption of Student-Centred Pedagogies. *Australasian Journal of Educational Technology*, *27*(6), 997–1013.

Girgin, U., Kurt, A. A., & Odabasi, F. (2011). Technology Integration Issues in a Special Education School in Turkey. *Cypriot Journal of Educational Sciences*, *6*(1). Retrieved from Http://Search.Ebscohost.Com.

Hudson, R., & Porter, A. (2010). ICT Use to Improve Mathematics Learning in Secondary Schools. In *ACEC2010: Digital Diversity. Conference Proceedings of the Australian Computers in Education Conference. Melbourne, Australia: ACEC. Retrieved from Http://* Http://Acec2010.Acce.Edu.Au.

Khan, M., Hossain, S., Hasan, M., & Clement, C. K. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. *International Journal of Instruction*, *5*(2). Retrieved from Http://Search.Ebscohost.Com.

Khambari, M. N. M., Moses, P., & Luan, W. S. (2009). Laptop Ownership and Use among Educators: Reflections from School Teachers in Malaysia. *International Journal of Instruction*, *2*(2). Retrieved From Http://Search.Ebscohost.Com.

Kipsoi, E. J., Chang'ach, J. K., & Sang, H. C. (2012). Challenges Facing Adoption of Information Communication Technology (ICT) in Educational Management in Schools in Kenya. *Journal of Sociological Research*, *3*(1), Pages–18.

Kukali, A. N. (2013). Opportunities and Challenges for Use and Integration of Information Communication Technology in Management of Public Secondary Schools in Bungoma South District, Kenya. *International Journal*. Retrieved from Http://Www.Ijsr.Net.

Peeraer, J., & Van Petegem, P. (2011). ICT in Teacher Education in An Emerging Developing Country: Vietnam's Baseline Situation At The Start of "The Year of ICT." *Computers & Education*, *56*(4), 974–982.

Sang, G., Valcke, M., Van Braak, J., Tondeur, J., & Zhu, C. (2011). Predicting ICT Integration into Classroom Teaching in Chinese Primary Schools: Exploring the Complex Interplay of Teacher-Related Variables. *Journal of Computer Assisted Learning*, *27*(2), 160–172.

Stigler, J. W., & Hiebert, J. (2009). *The Teaching Gap: Best Ideas from the World's Teachers for Improving Education in the Classroom*. Simon and Schuster. Retrieved from Http://Books.Google.Com.

Tsai, C. C., & Chai, C. S. (2012). The "Third"-Order Barrier for Technology-Integration Instruction: Implications for Teacher Education. *Building The ICT Capacity of the Next Generation of Teachers in Asia. Australasian Journal of Educational Technology*, *28*(6), 1057–1060.

Wachira, P., & Keengwe, J. (2011). Technology Integration Barriers: Urban School Mathematics Teachers Perspectives. *Journal of Science Education and Technology*, *20*(1), 17–25.

TEACHERS' WILLINGNESS TO INTEGRATE ICT TOOLS IN CLASSROOM TEACHING AMONG PRIMARY SCHOOL TEACHERS IN MSAMBWENI SUB-COUNTY KWALE COUNTY, KENYA

Henry O. Ayot
Kenyatta University
hoayot@yahoo.com

John O. Ogembo
Kenyatta University
jogemboh@yahoo.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

This study sought to explore the extent to which demographic and contextual factors predicted teachers' willingness to use ICT tools in classroom teaching. Empirical evidence has shown that teachers' perception of a concept is an important attribute of the success or failure of implementation of the concept. To achieve this, the study sought to find out if demographic factors such as age, gender, years of teaching experience and the teachers area of specialisation (department) influenced teachers' willingness to integrate ICT as well as the extent of the contribution of contextual factors such as teachers' level of mastery and self-efficacy. The study was conducted among a sample of 126 primary school teachers in Msambweni District in Kwale County, Kenya. Data was collected through a self-report questionnaire constructed by the researchers. The study findings revealed that while age and having access to an internet enabled phone were a negative significant predictor of teachers' willingness to integrate ICT, gender, teaching experience and teachers' area of specialisation were positive insignificant predictors. Similarly, teacher's level of mastery was found to predict their willingness to integrate ICT with teachers' mastery of ICT in teaching being significant. The study also established that teachers' level of use of ICT tools was still very low even where ICT tools were already available and therefore recommends that the government supports teachers by in-servicing them on ICT skills to increase mastery thus willingness of use. Similarly, it is important that schools put in place departmental ICT support structures to institutionalize integration of ICT in classroom teaching.

Keywords: ICT tools, Willingness, ICT integration, Mastery.

Introduction

Studies have associated improved quality and quantity of teaching and student learning with consistent use of ICT tools such as computers and the Internet in classroom teaching (Miima, Ondigi & Mavisi, 2013; Sabzian & Gilakjani, 2013). Thus, the belief that integration of ICT tools in classroom teaching positively impacts student learning has led many governments, Kenyan government included in creating programs for the integration of the tools in schools. However, early studies reported some teachers' resistance to integration of ICT in classroom learning (Sheingold & Hadley, 1990). Even several recent studies have demonstrated that most teachers will not adopt the use of computers in those schools surveyed (Miima, Ondigi & Mavisi, 2013). The purpose of this study was therefore to assess and describe the effect of primary school teachers' demographics and contextual factors on their willingness to integrate ICT tools in classroom teaching. By examining the effects of their willingness, the conditions and requirements for motivating them can be identified and improved.

Teachers' willingness to use ICT tools such as computers in classroom is a factor of their attitude towards use of such tools and the importance that they attach to the use of the tools in classroom teaching. According to Sabszian and Gilakjani (2013), it is a factor of the biases and stereotypes that teachers may hold about the use of computers and the factors that act as facilitators to teachers' positive computer usage. The researchers also hold that teachers' attitudes towards computers affect the successful use of computers in the classroom and these attitudes, whether positive or negative, affect how teachers respond to technologies. It has been alleged by some researchers that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning (Hew & Brush, 2007; Keengwe & Onchwari, 2008).

Resistance to use of ICT tools in classroom teaching by teachers has been attributed to several reasons. Mayya (2007) posit that there is a natural tendency to resist new ways of doing things. According to Taneri and Seferoglu (2013), the reasons for teachers' resistance to integrate technology include internal factors such as teachers ICT competencies and teachers' attitudes towards the integration of ICT tools in the lessons or external factors like their in-service education about ICTs, lack of appropriate hardware and software, having Internet connection troubles, lack of infrastructure, and insufficient teaching materials. Other researchers posit that teachers' confidence in utilizing technology, their beliefs about the value of technology and student learning were internal factors that prevented teachers from using technology (Dexter, Seashore & Anderson, 2002; Newhouse, 2001; Zhou, Pugh, Sheldon & Byers, 2002). According to Keengwe and Onchwari (2007) teacher's negative attitude is responsible for the slow acceptance of modern technology in the educational environment which is supported by Tanneri and Seferoglu (2013) who hold that lack of personal confidence in using learning technologies, and the nature of pre-service teacher education courses are some of the factors responsible for teachers resistance to use ICT tools in classroom teaching.

Contradictory findings exist on the link between demographic factors and teachers' willingness to use ICT tools. Two major trends emerge in research. While some studies (Alazzam, Bakar, Hamzah & Asimiran, 2012; Norris, Sullivan, Poirot & Soloway, 2003) found out that gender, age and teaching experience were not significant predictors of teachers' willingness to use ICT tools, others, (Blankenship, 1998; Lau & Sim, 2008) have found differences in the willingness on the basis of the demographic factors. Lau and Sim, (2008) found that teachers' age influences their willingness to use ICT tools and that older teachers frequently used computer technology in the classrooms more than the younger teachers. Likewise Jamieson-Proctor, Burnett, Finger and Watson (2006) posit that male teachers are more willing to use ICT tools which is refuted by Blankenship (1998) who found female teachers to be more willing users than male teachers.

Similar findings exist on link between contextual factors and their willingness to integrate ICT tools. Mastery experiences involve direct, personal performance of a task, or the actual experiences that an individual undergoes (Wangeri & Otanga, 2014). Yan (2002) found that mastery in IT was a significant predictor of the use of innovative teaching methods that is supported by Wangeri and Otanga (2014) who found that teachers' mastery of teaching skills accounted for 20.8% of variance in use of innovative methods. Researchers have also shown that willingness and effective use of computers is dependent on the teachers' ICT skills as well as their intentions towards ICT use (Vanderlinde, Braak & Hermans, 2009; Venezky, 2004). To them, relevant professional development can take the form of observing colleagues, learning from each other, observation of each other's' ICT-integrated lessons, as well as the provision of opportunities for teachers to share and collaborate with each other (Flanagan & Jacobsen, 2003; Jacobsen, 2002; Prain & Hand, 2003). Sandholtz and Reilly (2004) on their part claim that teachers' technology skills are strong determinant of ICT integration, but they are not conditions for effective use of technology in the classroom.

Though these studies are very important to this work, they were done in developed countries and majorly based in secondary and higher education systems. The paper focuses on the teachers' perspective about integration of ICT in teaching and learning in Kenyan primary schools an area with minimal empirical data.

Objectives

The study specifically sought to:

1. Assess teachers sources of knowledge in use of ICT tools
2. Determine the extent to which teachers' demographic factors influence their willingness to use ICT.
3. Determine the extent to which teachers' mastery of teaching methods influences their willingness to use ICT.
4. Determine the influence of departmental support on teachers' willingness to use ICT.

Conceptual Framework

The study conceptualizes the interrelationship between the elements presumed to predict willingness to integrate ICT tools in classroom teaching by teachers as is illustrated in figure

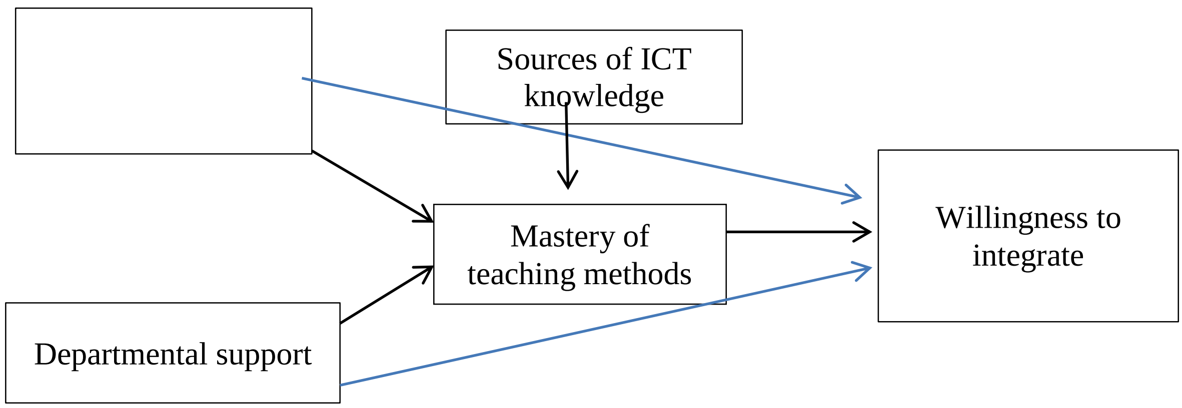


Fig1. Hypothesised interrelationships of variables of teachers' willingness to integrate ICT

Figure 1 shows the hypothesised relationship of the elements that are perceived to predict teachers' willingness to integrate ICT tools in classroom teaching. Integration of ICT tools involves a number of independent variables. These include background factors and departmental support that are mediated to by mastery of teaching methods.

Research Methodology

Participants and Procedure

Participants were 126 (57 female, 69 male) teachers in primary schools in public primary schools in Msambweni sub – county in Kwale County, Kenya. The respondents were told that the study aimed at improving their teaching in schools. Respondents completed a questionnaire constructed by the researchers. The questionnaire was completed during their free time.

Measures

Sources of knowledge in ICT. Two items measured teachers' sources of knowledge in ICT tools that were sub-divided into two. The first statement "How did you obtain your knowledge in IT' was to ascertain teachers' source of knowledge while the second, If given a computer, which of the following operations are you able to perform?' intended to assess the task that teachers could perform with this knowledge. The ratings were made on a 4-point scale.

Mastery of techniques of instruction. An item each measured the extent of mastery of whole class instruction, small group instruction and use of Information Technology; all ratings were made on a 5-point scale (1 = very low skilled, 5 = most skilled). A mean score of each item was computed.

Departmental support. Two statements were used to rate teachers' perception of the support they received from departmental colleagues. A mean score of the 2 items was computed.

Dependent Variable. The teachers' willingness to integrate ICT tools was measured based on the respondents' conception of their readiness to use available ICT tools including Internet enabled phones.

Results and Discussion

Descriptive

Means, standard deviations, and intercorrelations for scores on each of the variables are presented in Table 1 for the total sample (Appendix) while results from regression analysis are presented in Table 2. Willingness to integrate ICT tools in classroom teaching was positively and significantly correlated with age, gender, experience and departmental support. It was also highly correlated with mastery of whole class instruction, small group instruction and overall mastery. Departmental support was strongly correlated with mastery of whole class instruction, mastery of small group instruction and overall mastery. As expected mastery of whole class instruction was positively correlated with mastery of small group instruction. The implication is that mastery of whole class instruction and small group instruction are mutually inclusive.

Sources of Teachers Knowledge in ICT

The first objective intended to assess source of teachers' knowledge in ICT tools. Frequency and percentages were used to describe teachers' sources as well as the extent of application of such knowledge. Data obtained illustrated that a majority of the teachers, 79 (62.7%) had attended formal training in ICT from where they obtained knowledge on use of ICT tools as compared to those who learnt by observing their friends/colleagues use the ICT tools (42 – 33.3%), those who acquired the knowledge themselves either from a computer using computer manual (2 – 1.6%) or from internet enabled phones (3 – 2.4%). Further, the results demonstrated that except for management of data from CD, flask disk or other storage device which reported low rate of use (36.5%), the use of ICT tools such as internet browsing (79.4%), Microsoft windows (77.8%) and storage and sharing of information (54.8%) were reported to be fairly in active use at variable rates. On the whole, teachers reported some levels of knowledge in use of the tools with formal basic training in ICT being the most predominant source. Relative to applicability of this knowledge, a considerable proportion of the teachers indicated that they could browse for information from the internet (79.4%), (77.8%) could use Microsoft windows systems while (54.8%) could store and share information using ICT tools. In line with previous research, Sandholtz and Reilly (2004) on claim that teachers' technology skills are strong determinant of ICT integration, though they are not conditions for effective use of technology in the classroom.

Influence of Teachers' Demographic Factors on their Willingness to Integrate ICT

The second aim of the study was to determine the influence of teachers' demographic factors on their willingness to integrate ICT tools in classroom practice. A majority of the teachers were found to be 35 years and above (72.2%) and there were slightly more males (54.8%) than females (45.2%). Similarly, (64.3%) had over 10 years working experience and the teachers were almost fairly distributed across the departments though social studies (7.9%) and Kiswahili (16.7%) had slightly fewer members. Further, though almost all of the respondents (98.4%) acknowledged having a phone, only 59.5% indicated that their phones were Internet enabled. Findings of the study indicate that teachers in the 25 – 34 and 35 – 45 recorded the highest levels of willingness to integrate ICT tools (M = 3.66, 3.60) respectively. The lowest means were reported by those above 45 years of age (M = 3.00). Female teachers recorded a higher level of willingness to integrate (M = 3.59) as compared to their male counterparts (M = 3.26) with females in the 25 – 34 age bracket reporting the highest levels of willingness (M = 3.69). ANOVA results show a significant effect of age on willingness to integrate, F (2, 118) = 10.30, p < .001,0.1] with minimal partial Eta Squared. Similarly, gender was found to have a significant effect on willingness to integrate, F (1, 118) = 8.88, p = .004] though the effect size was even less minimal. Post Hoc test showed that willingness to integrate ICT tools by teachers of 25 – 34 age is significantly different from those of above 45 years (p < .001), the difference being more pronounced for female teachers in these age groups. Further, a hierarchical regression analysis was conducted to establish the respective contributions of demographic factors such as age, gender, teaching experience, the teachers' department and having an internet enabled phone on willingness to integrate ICT tools in teaching. It was found that 6.4% of the variance in willingness to integrate was accounted for by age, F (1, 122) = .205, p = .005]. When entered, gender accounted for 1.9% of variance in willingness to integrate beyond that accounted for by age F (2, 121) = .148, p = .117]. Experience, department and having an internet enabled phone explained 0.0%, 0.6% and 9.8 % variance in willingness to integrate respectively F (3, 120) = .006, p = .928; F (4, 119) = .038, p = .364 and F (5, 118) = .356, p = .025.]. The regression equation for influence of demographic factors on willingness to integrate which was found to be significant (p = .042) showed that the factors accounted for 18.7% of the total variance. Specifically, age and having an Internet enabled phone were found to have a significant negative influence on teachers' willingness to integrate though gender, teaching experience and department each had a positive insignificant influence. These findings were found to generally support those of Lau and Sim, (2008) who maintains that teachers' age influences their willingness to use ICT tools though it contradicts it on specificity of age differences since according to the researchers, older teachers were found to frequently use computer technology in the classrooms more than the younger teachers. Likewise, the findings on gender concurs with Blankenship (1998) who found female teachers to be more willing users than male teachers but disagrees with Jamieson-Proctor, Burnett, Finger and Watson (2006) who posit that male teachers are more willing to use ICT tools.

Influence of Mastery on Teachers Willingness to Integrate ICT Tools

The study also aimed at determining the influence of mastery of teaching skills on teachers' willingness to integrate ICT tools. The findings were as summarized in Table 1 and 2 in the appendix. It was found that teachers had high perceptions of their levels of mastery of whole class instruction (M = 3.7778), small group instruction (M = 3.7778) and use of ICT tools (M = 3.1508). Mastery was also found to be generally high (M = 10.7063, SD = 1.54437). The hierarchical regression model used showed that influence of mastery of whole class instruction accounted for 2.5% of the total variance on willingness to integrate F (1, 124) = -.019, p = 834, mastery of small group instruction accounted for 16.9% F (2, 123) = .517, p = .081 while mastery of ICT skills accounted for 44.7% of the total variance [F (2, 122) = .341, p < .001. The models which were generally significant (p < .05) also showed that individually, mastery of whole class teaching is an insignificant negative determinant of teachers' willingness to integrate ICT tools while mastery of small group instruction is an insignificant positive determinant. However the results showed that mastery of ICT method of instruction influences willingness to integrate ICT tools positively, the finding being significant (p < .05). On whether or not mastery of teaching methods mediated for demographic factors and departmental support, against teachers willingness to integrate ICT tools, mediation effects were seen F (2, 123) = 2.611; F (2, 123) = 1.940. This means that it is imperative that teachers develop their ICT skills as a way of enhancing the process of ICT integration. The findings are largely consistent with those of Wangeri and Otanga (2014) as well as Yan (2002) who in their research found that mastery in IT is a significant predictor of the use of innovative teaching methods. It also corroborates the assertions of Vanderlinde, Braak and Hermans (2009) and Venezky (2004) who insists that willingness and effective use of computers is dependent on the teachers’ ICT skills as well as their intentions towards ICT use.

Influence of Departmental Support on Teachers Willingness to Integrate ICT Tools

Lastly the study set out to determine the influence of departmental support on teachers’ willingness to integrate ICT tools in classroom practice. Two items were used for this purpose. The first item attempted to determine teachers’ perception of the extent to which their departments could be contributing in enhancing their knowledge in ICT. In response, 73 (57.9%) which is a slight majority acknowledged receiving instrumental support from their departmental colleagues. A subsidiary item which was intended to quantify the extent of the departmental support received by teachers reported that 24 (19.0%) had received useful suggestions on use of ICT tools on between 3 and 5 occasions, 96 (76.2%) had had support equivalent to 6 to 10 times while 3 (2.4%) had had departmental support on more than 10 occasions. A linear regression analysis performed to infer on the influence attributed 4.0% of the total variance to departmental support, F (1, 124) = -.034, p = .495. Departmental support was thus indicated to have an insignificant negative influence on willingness to integrate ICT tools. Though this could be interpreted to mean that departmental support may not account for much relative to teachers’ willingness to integrate ICT tools, previously research has shown that observing colleagues, learning from each other, observation of each other’s’ ICT-integrated lessons, as well as the provision of opportunities for teachers to share and collaborate with each other is a significant predictor of teachers’ willingness to integrate ICT tools (Flanagan & Jacobsen, 2003; Jacobsen, 2002; Prain & Hand, 2003).

Implications, Limitations and Conclusions

Implications for the innovation of teacher preparation

According to our findings, willingness to integrate ICT tools in classroom teaching is influenced by the complex of teachers’ background factors such as age, access to the ICT tools and mastery of ICT instructional skills. The latter implies that teacher education should reconsider its training approaches which include being carried out in constructivist learning environment that provide student teachers with a conducive and non-threatening environment to experience success in using the computers. This will allow them to gain competence and confidence in using computers for teaching and learning (Teo, 2008). In addition, Albion (1999) stresses the need for real life experiences in classroom settings.

Limitations and Directions for Further Research

It should be noted that this study has a number of limitations. The quantitative research methodology is mainly based on self-report measures. Future studies could build on classroom observation of teachers’ integration of ICT tools or interviews with the teachers. Furthermore, longitudinal studies are recommended that might be helpful to track changes in thinking processes and related teaching practices with and without educational technologies. Since the potential of ICT can differ according to specific curriculum goals and specific knowledge domains, more attention should be paid in future studies to the nature of the curriculum taught with or without ICT. It should also be noted that the findings of the present study have to be interpreted in a careful way since a convenience sampling procedure was applied. Respondents were drawn from most primary schools in the sub – county that the researchers could readily access which could have caused uncontrolled bias.

Conclusion

Our study has provided insight into the influences of various factors on teachers' willingness to integrate ICT tools in classroom teaching in a Kenyan context. The findings suggest that successful digitization of the primary school classroom as is anticipated by the government largely depends on teachers' willingness to use the technology tools. The results underpin the importance of an integrated and concurrent understanding of teachers' thinking processes and suggest that in order to attain the innovation of classroom activities; teachers need to be actively involved.

References

Alazzam, A. O., Bakar, A. R., Hamzah, R. & Asimiran, S. (2012). Effects of demographic characteristics, educational background, and supporting Factors on ICT readiness of technical and vocational teachers in Malaysia. *International Education Studies*. *5*(6).

Albion, P. R. (1999). Self-efficacy beliefs as an indicator of teachers' preparedness for teaching with technology. *Computers in the Social Studies*, 7(4).

Blankenship, S. E. (1998). Factors related to computer use by teachers in classroom instruction. Doctoral Dissertation, Virginia Polytechnic Institute and State University.

Dexter, S., Seashore, K.R. & Anderson, R.E. (2002) Contributions of Professional Community to Exemplary Use of ICT. *Journal of Computer Assisted Learning*. 18, pp. 489-497.

Flanagan, L., & Jacobsen, M. (2003). Technology leadership for the twenty-first century principal. *Journal of educational administration*, *41*(2), 124-142.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, *55*(3), 223-252.

Jacobsen, D.M. (2002), "Building different bridges two: a case study of transformative professional development for student learning with technology", paper presented at the 83rd Annual Meeting of the American Educational Research Association, New Orleans, Louisiana, 1-5 April, available at: www.ucalgary.ca/~dmjacobs/aera/building_bridges_two.html

Jamieson-Proctor, R. M., Burnett, P. C., Finger, G., & Watson, G. (2006). ICT integration and teachers' confidence in using ICT for teaching and learning in Queensland state schools. *Australasian Journal of Educational Technology*, *22*(4).

Keengwe, J., & Onchwari, G. (2008). Constructivism, technology, and meaningful learning. *Handbook of research on instructional systems and technology*, 51-64.

Lau, B. T., & Sim, C. H. (2008). Exploring the extent of ICT adoption among secondary school teachers in Malaysia. *International Journal of Computing and ICT Research*, *2*(2), 19-36.

Miima, F. Ondigi, S.R. & Mavisi, R. (2013). Teachers' perception about integration of ICT in teaching and learning of Kiswahili language in secondary schools in Kenya. *International Journal of Arts and Commerce*, *2*(3) (March 2013)

Newhouse, C. P. (2001). Applying the concerns-based adoption model to research on computers in classrooms. *Journal of research on technology in education*, *33*(5), n5.

Norris, C., Sullivan, T., Poirot, J., & Soloway, E. (2003). No access, no use, no impact: snapshot surveys of educational technology in K# x2013; 12. *Journal of Research on Technology in Education*, *36*(1), 15-27.

Núñez, M., Quirós, R., Núñez, I., Carda, J. B., & Camahort, E. (2008, July). Collaborative augmented reality for inorganic chemistry education. In J. L. Mauri, A. Zaharim, A. Kolyshkin, M. Hatziprokopiou, A. Lazakidou, M. Kalogiannakis, ... & N. Bardis (Eds.), *WSEAS International Conference. Proceedings. Mathematics and Computers in Science and Engineering* (No. 5). WSEAS.

Prain, V., & Hand, B. (2003). Using new technologies for learning: A case study of a whole-school approach. *Journal of research on technology in education*, *35*(4), 441-458.

Sabzian, F. & Gilakjani, P.A., (2013). Teachers' attitudes about computer technology training, professional development, integration, experience, anxiety, and literacy in English language teaching and learning. *International Journal of Applied Science and Technology*, *3* (1); January 2013

Sandholtz, J. H., & Reilly, B. (2004). Teachers, not technicians: Rethinking technical expectations for teachers. *Teachers College Record*, *106*(3), 487–512.

Sheingold, K. & Hadley, M. (1990). Accomplished teachers: Integrating computers into classroom practice. Center for Technology in Education, New York, NY.

Taneri, P. O., & Seferoglu, S. S. (2013). Instructional use of information technologies teachers' resistance to the use of new technologies. *International Journal of Technologies in Learning. 19*(3). 60 – 68.

Teo, T., (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology*, *24*(4), 413–424

Vanderlinde, R., van Braak, J., & Hermans, R. (2009). Educational technology on a turning point: curriculum implementation in Flanders and challenges for schools. *Educational Technology Research and Development*, *57*(4), 573-584.
Venezky, R. L. (2004). In search of the perfect orthography. *Written Language & Literacy*, *7*(2), 139-163.
Wangeri, T. & Otanga, H., (2014). Sources of personal teachers' efficacy and influence on teaching methods among teachers in primary schools in Coast Province, Kenya. *Global Journal of Interdisciplinary Social Sciences 3*(3) 190 – 195.
Yan, H. (2002). The effects of teacher efficacy on teaching method. The University of Hong Kong.
Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for classroom technology innovations. *Teachers College Record*, *104*(3), 482-515.

Appendix: Result Tables

Table 1: Means, standard deviations, and correlations between the variables of the study (N = 126)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1. Age	2.88	.658	-	.140	.690**	.270**	.399**	.376**	-.169	.261**	-.052
2.Gender	-	-	-	-	.306**	-.172	.100	.114	.156	.163	-.011
3. Experience	2.99	1.12			-	.100	.470**	.422**	-.031	.373**	.016
4. Department	2.76	1.20				-	.456**	.432**	.034	.399**	.088
5. Mastery – WCI	3.78	.679					-	.965**	.093	.890**	-.092
6. Mastery – SGI	3.78	.656						-	.134	.906**	-.134
7. Mastery – ICT	3.15	.658							-	.524**	.074
8. Mastery	10.70	1.54								-	-.066
9. Departmental S.	3.43	.515									-

Table 2: Summary of Results from Regression Analysis of Variables on Willingness to Integrate ICT

Variables	B	β	t	p	R^2	Adj.R^2	R^2 change
Age	-.205	-.253	-.2.892	.005	.064	.056	.064
Gender	.148	.139	1.579	.005	.083	.068	.019
Experience	.006	.011	.091	.015	.083	.060	.000
Department	.038	.084	.911	.024	.089	.059	.006
Mastery – WCI	-.019	.070	-.274	.785	.025	.001	.001
Mastery – SGI	.517	.274	1.886	.062	.169	.029	.028
Mastery – ICT	.341	.067	5.111	.000	.447	.200	.171
Departmental S.	-.034	-.040	-.450	.000	.040	.002	-

PREDICTORS OF EXTENT OF INTEGRATION OF COMPUTERS IN CLASSROOM TEACHING AND LEARNING AMONG SCIENCE AND MATHEMATICS TEACHERS IN PUBLIC SECONDARY SCHOOLS IN KWALE COUNTY, KENYA

Henry O. Ayot
Kenyatta University
hoayot@yahoo.com

John O. Ogembo
Kenyatta University
jogemboh@yahoo.com

Nicholas W. Twoli
Kenyatta University
nicholastwoli@yahoo.com

Investment in ICT infrastructure to improve teaching and learning in schools have been initiated by many governments globally with the effects being anticipated more in sciences and mathematics, subjects in whom students have continued to register poor performance year in year out. Despite all these investments, developing countries such as Kenya still report minimal rates of integration of ICT tools such as computers in classroom practice due to varied reasons. This study set out to review the extent to which demographic characteristics, attitude, self-concept and computer anxiety predict science and mathematics teachers extent of integration of computers in the teaching and learning of their subjects. Data were collected from 83 science and mathematics teachers purposively sampled from 24 public secondary school in Kwale County with ICT infrastructure for integration using a self-report questionnaire adapted from the Teachers Attitude towards Computers Scale (Gattiker & Hlavka, 1992), the Teachers Computer Anxiety Scale (Barbeite & Weiss, 2004) and self-concept instrument developed by Cambra and Silvestre (2003). The study findings revealed that though almost all the teachers had some basic training in ICT, they reported very low levels of utilisation of computers in classroom teaching. Further, it was observed that while teachers' qualification and computer attitude were significant predictors of the extent of their integration of computers into classroom practice ($p<0.05$), their self-concept and computer anxiety were insignificant predictors ($p>0.05$). Lastly, the study established that teachers' qualification and computer anxiety had a positive influence on extent of integration though attitude towards computer and self-concept had a negative influence. It is recommended that school administrators and Ministry of Education officers enhance supervision of the integration process to ensure that the ICT infrastructure already in schools are adequately utilised.

Key words: ICT Infrastructure, Computer Integration, Self – Concept

Introduction

Most governments, Kenyan included, recognizing that attainment of qualitative education requires improving teaching, learning and educational system in general, have made several attempts to effectively integrate ICT into the educational system. For the government of Kenya, the enactment of the 2006 National Information and Communication Technology Strategy for Education and Training (KESSP, 2006; MOE, 2006), which was to provide policy framework marked an important milestone in digitization of the classroom. The policy opened up a window of opportunity that enabled the coming together of various stakeholders to support digitization process. Their concerted effort since the early 1990 is seen in the ICT tools including computers, Internet connectivity and other peripherals available to schools (Ayere, Odera & Agak, 2010; Makau, 1990; Wambui and Barasa, 2007; Wanjira, 2009). Most notable contributors include the Agha Khan foundation, International Development Research Centre (IDRC) and the Rockefeller Foundation, Computer for Schools program, New Partnership for Africa Development (NEPAD), Bill Gates foundation and the Constituency Development Fund (CDF) (Ayere, Odera & Agak, 2010; Keengwe & Onchwari, 2008; Makau, 1990; Wambui & Barasa, 2007). The CDF in conjunction with the Ministry of

Education have lately specifically equipped at least eight schools in each sub-county in the entire republic with ICT infrastructure specifically meant for integration (MOE, 2012). Reports also show that some individual schools through the efforts of their Board of Managements (BOM) have also endeavored to equip themselves with ICT infrastructure in an attempt to modernize their learning environment (Farrell, 2007). Thus, through the concerted efforts of these contributors and others, a number of secondary schools in the republic have acquired adequate ICT infrastructure for use in classroom teaching and learning.

In doing this, the government and the stake holders aimed at improving accessibility of educational opportunities and fostering proficiency among students and youths with the main aim being able to meet the human resources requirements of the nation for attaining and enhancing sustainable socio-economic development, global competitiveness as well as the individual's ability to survive in a contemporary competitive environment (Agbatogun, 2010). Nowhere else is the interest more pronounced than in mathematics and sciences; subjects in which students have continued to post poor results year in year out in most countries, Kenya included (Albirini, 2004; Ogembo, 2012; Twoli, 1986).

However, anecdotal reports show that a majority of teachers to a large extent still do not integrate computer and other ICT tools in classroom teaching (Miima, Ondigi & Mavisi, 2013). Oredo (2008) in his report of a study of quantity and quality of computer use in Kenya by teachers and students in primary teacher colleges noted low rates of usage (22% for teachers and 6% for students). Similarly, Unwin (2004) laments that computer laboratories in most educational institutions in Africa are underutilized. Specifically, the researcher noted that the overall quantity of computer use in sampled schools stood at 14%. Further, Kiptalum and Rodrigues (2010) laments that opportunities for realizing the benefits of using ICT in education face a number of challenges in the developing countries.

Studies have linked teachers' reluctance to integrate ICT tools in general and computer in particular to several factors including access (MOE, 2006), teachers' biases or stereotypes (Sabszian & Gilakjani, 2013), internal factors such as teachers ICT competencies and teachers' computer attitude. Part of the blame has also been apportioned to external factors like teachers' in-service education about ICTs, lack of appropriate hardware and software, having Internet connection troubles, lack of infrastructure, and insufficient teaching materials (Taneri & Seferoglu, 2013). Other researchers posit that teachers' confidence in utilizing technology, their beliefs about the value of technology and student learning are internal factors that prevents teachers from using technology (Dexter, Seashore & Anderson, 2002; Newhouse, 2001; Zhou, Pugh, Sheldon & Byers, 2002). Further, Keengwe and Onchwari (2008) holds that teacher's negative attitude is responsible for the slow pace of acceptance of modern technology in the educational environment. Tanneri and Seferoglu (2013) on their part posit that lack of personal confidence in using learning technologies such as computer, and the nature of pre-service teacher education courses are some of the factors responsible for teachers' resistance to the use of these tools in classroom teaching.

Similarly, an assessment of teachers' computer attitudes has shown that there exists a direct link between the tendency to understand and determine their technology adoption and integration capabilities in the education system. According to Agbatogun (2010), successful integration of computers in educational environments doe not only depends on students' attitudes towards them, but also that of their teachers. The researcher is categorical that attitudes are precursors of behavior and behavioral intents. Therefore, positive disposition towards computers is a prerequisite as well as a catalyst to acquiring a high level of computer literacy and successful pedagogical use of the technology (Francis, Katz, & Jones, 2000). Computer anxiety levels of teachers are significant in the consideration of the integration of computer technology into teaching and learning. Anxiety is a long-term physiological construct.

There exist contradictory research findings on the influence of various factors on computer integration in classroom teaching. For instance while Alazzam, Bakar, Hamzah and Asimiran, (2012); Norris, Sullivan, Poirot and Soloway (2003) found no link between teachers demographic factors including gender, age and teaching experience and their extent of integrating computer in classroom teaching, Blankenship (1998); Lau and Sim (2008) have found differences in the extent of integration on the basis of the demographic factors. Specifically, Lau and Sim, (2008) found that teachers' age influences their extent of integrating computer and that older teachers frequently used computer technology in the classrooms more than the younger teachers. Likewise Jamieson-Proctor, Burnett, Finger and Watson (2006) indicated that male teachers were more willing users of computers. This assertion is however refuted by Blankenship (1998) who found female teachers to be more willing users than male teachers.

Relative to influence of computer anxiety, Russell and Bradley (1998) in a study among 350 primary and secondary school teachers in Australia found that teachers' perception of computer usefulness is associated with individual's level of computer anxiety. Likewise, in a study on computer achievement, attitude and anxiety among 75 Taiwanese computer students, Tsai and Tsai (2003) found a significant association between students' meta-cognitive skills, computer achievement and their level of computer anxiety. Studies have also shown that there is a relationship between computer anxiety and some other variables such as age (Namlu & Ceyhan, 2002); frequency of computer use (Necessary & Parish, 1996); computer experience (Yaghi & Ghait, 2002); neuroticism (Anthony, Clarke & Anderson, 2000) and individual's appraisal of computing situation (Crable, Brodzinski, Scherer & Jones, 1994).

Self-concept which is an individual's internal representation of who he/she is (Malle, 1999) is the product of all an individual's self-belief and self-evaluation (Hattie, 1992). It is the universal understanding a sentient being has of oneself. Self-concept has been emphasized as a key indicator of an individual's attitudes, behaviour, and coping abilities. A positive self-concept is equated with positive evaluation, while negative self-concept is associated with negative evaluation (Huitt, 2004). With regard to its relevance in predicting computer integration, it was found to be the second most portent predictor (Agbatogun, 2010).

These studies though providing a much needed insight on the dynamics of use of computer in classroom setting lacks the specifics of Kenyan secondary school classroom set up which if available could provide avenues of assessing the progress of integration thus mitigate the massive investments that has so far been undertaken to date by the stakeholders. Since inception of most of the programs of enhancing IT infrastructure accessibility in secondary school classrooms, empirical data that could help provide an insight on the extent and effect of their usage including the attendant factors that could be impacting the process of integration are sparse. This study therefore set out to assess the extent to which science and mathematics teachers' demographic factors, computer attitude, computer anxiety and self-concept could be predicting the extent of integration of computer in classroom teaching.

Objectives

The study specifically sought to:

1. Determine the extent to which science and mathematics teachers' background characteristics predict their extent of integration of computers in classroom teaching.
2. Establish the extent to which science and mathematics teachers' attitude predict their extent of integration of computers in classroom teaching.
3. Establish the extent to which science and mathematics teachers' computer anxiety predict their extent of integration of computers in classroom teaching.
4. Determine the extent to which science and mathematics teachers' self – concept predict their extent of integration of computers in classroom teaching.

Conceptual Framework

The study conceptualizes the interrelationship between factors presumed to predict teachers to integrate ICT tools in classroom teaching by teachers as is illustrated in figure 1.

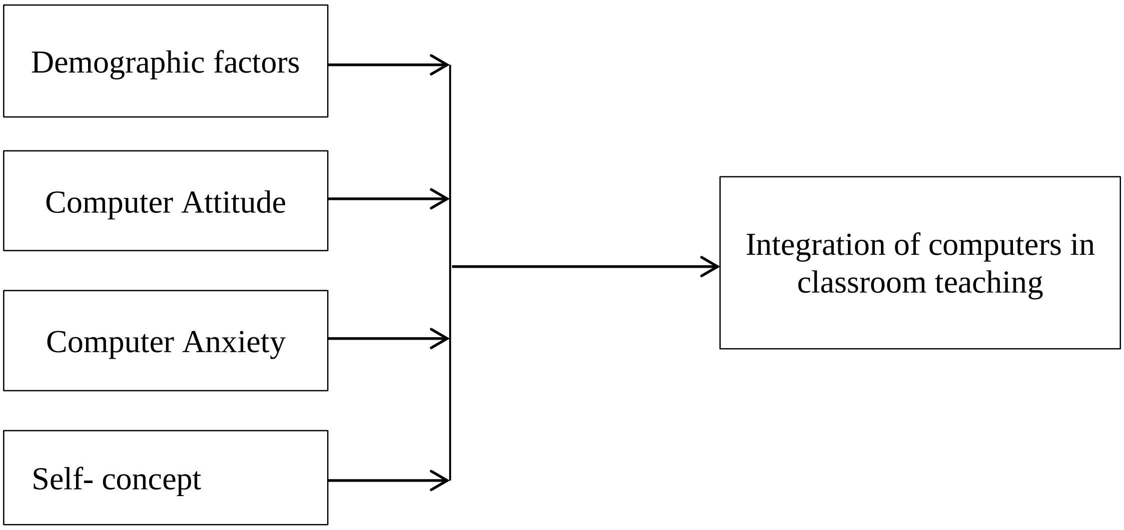


Figure 1: Hypothesised interrelationships of variables influencing computer integration

Figure 1 shows the hypothesized relationship of the elements that are perceived to predict science and mathematics teachers' integration of computer in classroom teaching. Integration of computer in classroom teaching involves a number of independent variables that include teachers' demographic factors, computer attitude and computer anxiety and teachers self-concept.

Research Methodology

Participants and Procedure

Participants were 82 (21 females and 61 males) science and mathematics teachers drawn from public secondary schools in Kwale County with ICT infrastructure for integration. The study was quantitative and employed descriptive survey method in which respondents were purposively sampled from public secondary schools with ICT infrastructure for integration. The respondents were told that the study aimed at obtaining information useful in improving their teaching in schools. They completed a questionnaire comprising of items adapted from the Teachers Attitude towards Computer Scale (Gattiker & Hlavka, 1992), the Teachers Computer Anxiety Scale (Barbeite & Weiss, 2004) and self-concept instrument developed by Cambra and Silvestre (2003).

Measures

Teachers' attitude towards computer. Eight items measured teachers' attitude towards computer based on the perceived ease of use and the perceived usefulness of computers. Sample items included "I believe working with computers is very difficult, is very complicated' and makes a person more productive in his/her job. The ratings were made on a 5-point scale.

Teachers' computer anxiety. Nine items measured the extent to which teachers' computer anxiety influenced their integration of the ICT tool in classroom teaching. Sample items included 'Working with a computer makes me nervous, I get a sinking feeling when I think of trying to use a computer and Computers make me feel uneasy '. The ratings were made on a 5-point scale and a mean score was computed for the items some of which were reverse coded.

Teachers' self-concept. Ten items measured the extent to which respondents' self – concept could be influencing their integration of computers in classroom teaching. Sample items included 'My colleagues think I'm unfriendly, others want to work with me and I'm happy the way I am'. Mean scores of the items were computed.

Extent of integration of computer in classroom teaching. Teachers rated their perceived of integration of computer in classroom teaching. The scale consisted of 2 items (e.g. 'I integrate computers in my classroom teaching' and 'If yes please what is the frequency of use) the first rated on a 2 – point scale while the other on a 4-point scale (1 = Rarely, 4 = always).

Findings

Predictors of Extent of Science and Mathematics Teachers' Integration of Computer

A hierarchical regression analysis was conducted to establish the respective contributions of demographic factors, attitude, computer anxiety and self – concept on extent of integration of computers in classroom teaching. Table 1 displays the means, standard deviations and Pearson correlations among all the variables and Table 2 reports the results of the regression analysis. Teachers self – concept was positively and significantly correlated with attitude towards computer, teachers' workload and area of specialisation. It was also negatively and significantly correlated with gender. Computer anxiety was significantly and positively correlated with teachers' qualification, area of specialisation and training in IT while teachers' attitude towards computers was positively and significantly correlated with gender and teachers' area of specialisation.

The first objective of the study was to determine the extent to which science and mathematics teachers' demographic factors predicted their integration of computer in classroom teaching. Findings of the study indicate that more of the respondents, 59 (72%) integrated computer in their classroom teaching as compared those who did not (28%). Qualitatively, 17 (20.7%) reported using the ICT tool in classroom teaching rarely, 22 (26.8%) used it once per week, 16 (19.5%) twice per week while a paltry 7 (8.5%) reported their rate of use to be always. Further analysis showed that on specific demographic factors, more males, 51 (62.2%) as compared to females were active users while graduate teachers, 42 (51.2%) reported the highest extent of use based on education qualification. Similarly, teachers with less than 5 years of teaching experience were more active users, (47.6%) and those with over 20 years of teaching experience reported the lowest tendency to integrate computers in classroom teaching. Teachers qualification reported high mean ($M = 4.52$ and $SD = 1.21$). ANOVA results show a significant effect of level of education on tendency to integrate computer in classroom teaching F (5, 53) = 5.45, $p < .001$]. Regression analysis showed that except for qualification which was found to be a significant predictor of science and mathematics teachers extent of integration of computer in classroom teaching, F (1, 57) = 4.04, $p < .001$], gender, teaching experience, area of specialisation, workload and training in IT were insignificant predictors, F (1, 58) = -.128, $p = .899$], F (1, 56) = .074, $p = .941$], F (1, 55) = 1.28, $p = .206$] F (1, 54) = .534, $p = .596$] F (1, 57) = .029, $p = .977$] respectively. The findings concerning the significant effect of demographic factors on extent of integration of computer in classroom teaching largely reflects those of Blankenship (1998); Lau and Sim (2008) but contradicts the assertions of Alazzam, Bakar, Hamzah and Asimiran, (2012); Norris, Sullivan, Poirot and Soloway (2003) who found no link between teachers demographic factors including gender, age and teaching experience and their extent of integration of computer.

The second objective of this study was to establish the extent to which science and mathematics teachers' attitude predicted their extent of integration of computer in classroom teaching. The results indicated high mean (4.09) and standard deviation of 1.001 for science and mathematics teachers' attitude towards computers. This could be interpreted to mean that the Kwale County science and mathematics teachers have a positive attitude towards computer, which could be a favorable attribute for integration. For instance, a significant proportion, 69 (84.2%) were categorical that working with a computer is not very difficult, 76 (92.6%) thought it was not complicated and 74 (90.2%) indicated that working with a computer makes one more productive in his/her work. ANOVA results show a significant effect of attitude on extent of integration of computers in classroom teaching F (2, 62) = 5.125, p = .009. Post Hoc Tukey's test showed a significant mean difference between the perception of respondents who thought that teachers attitude affected their extent of computer integration from those who were not sure (M = 1.18, p = .009). The regression equation used to test for the effect of attitude showed that it was positive and significant, F (1, 60 = 3.227, p = .002 and explained 14.8% of variance in extent of integration of computers in classroom teaching. This finding corroborates those of Keengwe and Onchwari (2007) who posits that teacher's negative attitude is responsible for the slow pace of acceptance of modern technology in the educational environment. Similarly, Agbatogun (2010) maintains that successful integration of computers in educational environments does not only depend on students' attitudes towards them, but also that of their teachers. Francis, Katz, and Jones (2000) on their part hold that positive disposition towards computers is a prerequisite as well as a catalyst to acquiring a high level of computer literacy and successful pedagogical use of the technology.

A further objective intended to assess the extent to which computer anxiety predicted science and mathematics teachers' integration of computer in classroom teaching. Results showed that the respondents had an average level of computer anxiety given an average mean rating of 2.640 and standard deviation of 1.09 of the elements of computer anxiety. Sample responses showed that though more respondents, 76 (92.7%) indicated that computer do not scare them at all, 74 (90.3%) said they do not feel threatened when others talk about computers and 69 (84.1%) maintained that they feel comfortable working with computer, 74 (90.3%) acknowledged that working with a computer sometimes makes them nervous and 55 (67.1%) admitted that it would bother them to take computer courses. ANOVA results F (3, 58) = 4.020, p = .011 showed that there is a significant effect of computer anxiety on teachers extent of computer integration with those for the effect scoring highly (M = 2.67) on the elements of perception. Regression analysis results confirmed that computer anxiety had a negative and insignificant effect on teachers' extent of integration of computer in classroom teaching, F (1, 60 = -1.040, p = .303. This finding partially supports that of Agbatogun (2010) who found out that computer anxiety is the single most portent predictor of teachers' tendency to integrate ICT in classroom teaching. It also conforms to the findings of Russell and Bradley (1998) as well as Tsai and Tsai (2003) who in separate studies on computer achievement, attitude and anxiety, found a significant association between students' meta-cognitive skills, computer achievement and their level of computer anxiety.

The last objective for this study intended to assess the extent and effect of teachers' self-concept on their extent of integration of computer in classroom teaching. Findings showed that generally, science and mathematics teachers' self-concept was high (M = 32.60, SD = 2.449). A significant proportion of the respondents, 63 (76.9%) denied that their friends think they are unfriendly, 68 (82.9%) thought their friends liked them, 73 (89%) thought others were happy to work with them while 82 (100%) were happy the way they were. ANOVA results, F (10, 51) = 3.410, p = .002 shows that there is a significant relationship between science and mathematics teachers' self-concept and their extent of integration of computer in classroom teaching with those for the effect scoring highly (M = 3.000) on the elements of perception. Regression analysis results indicated that teachers' self-concept has a negative and insignificant effect on their extent of integration of computer in classroom teaching, F (1, 60

= 1.057, p = .298 (Table 2). This finding partially supports that of Agbatogun (2010) who in his findings stated that self-concept are the second most portent predictor of teachers' extent of computer integration in classroom teaching.

Implications, Limitations and Conclusions

Implications for the Innovation of Teacher Preparation

The findings have illustrated that the extent of integration of computer in classroom teaching is predicted by a mix of factors that include teachers' background factors such as level of education and experience, attitude towards computer, computer anxiety and teachers self-concept. Specifically, while teachers level of education, experience and attitude towards computers were found to predict their extent of integration positively, computer anxiety and teachers self-concept predict it negatively. This implies that keen interest needs to be taken in providing teachers with an environment that could help foster positive attitude and self-concept. This would enable them gain competence and confidence in using computers for teaching and learning (Teo, 2008) and as well develop real life experiences in using computer in classroom settings.

Limitations and Directions for Further Research

It should be noted that this study has a number of limitations. The quantitative research methodology is mainly based on self-report measures. Future studies could build on classroom observation of teachers' integration of computers or interviews with the teachers. Furthermore, longitudinal studies are recommended that might be helpful to track changes in thinking processes and related teaching practices with and without educational technologies. Since the potentials of ICT can differ according to specific curriculum goals and specific knowledge domains, more attention should be paid in future studies to the nature of the curriculum taught with or without ICT. It should also be noted that the findings of the present study have to be interpreted in a careful way since a convenience sampling procedure was applied. Respondents were drawn from secondary schools in the county with ICT infrastructure that the researchers could readily access which could have caused uncontrolled bias.

Conclusion

The study has provided an insight into the predictors of science and mathematics teachers' integration of computers in classroom teaching in a Kenyan context. The findings suggest that science and mathematics teachers' extent of integration of computers in classroom teaching is largely dependent on their level of education, attitude and experience. The results also showed that computer anxiety and self-concept were inhibitors of teachers' urge to integrate computers in classroom teaching. The study advocates for in servicing of teachers to enable them gain requisite knowledge, skills and confidence relevant for the innovation of classroom activities.

References

Agbatogun, A. O. (2010). Self-concept, computer anxiety, gender and attitude towards interactive computer technologies: A predictive study among Nigerian teachers. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 2010, Vol. 6, Issue 2, pp. 55-68 Alazzam, A. O., Bakar, A. R., Hamzah, R. & Asimiran, S. (2012). Effects of demographic characteristics, educational background, and supporting Factors on ICT readiness of technical and vocational teachers in Malaysia. *International Education Studies*. *5*(6).

Albirini, A. (2004). "Teachers' attitude toward information and communication technologies: the case of Syrian EFL teachers". Computers & Education, vol. 47, no. 4, pp. 373-398.

Anthony, L. M., Clarke, M. C., & Anderson, S. J. (2000). "Technophobia and personality subtypes in a sample of South African University student". Computer in Human Behavior, vol.16, no.1, pp.31-44.

Ayere M. A, Odera F. Y. and Agak J. O. (2010). E-learning in secondary Schools in Kenya: A Case of the NEPAD E-schools. *Educational Research and Reviews* Vol.5 (5), pp. 218-223. Barbeite, F. G., & Weiss, E.

M. (2004). Computer self-efficacy and anxiety scales for an Internet sample: testing measurement equivalence of existing measures and development of new scales. *Computers in Human Behavior*, *20*(1), 1-15.

Blankenship, S. E. (1998). Factors related to computer use by teachers in classroom instruction. Doctoral Dissertation, Virginia Polytechnic Institute and State University.

Cambra, C., & Silvestre, N. (2003). "Students with special educational needs in the inclusive classroom: social integration and self-concept" European Journal of Special Needs Education, vol. 18, pp.197-208.

Crable, E. A., Brodzinski, J. D., Scherer, R. F., & Jones, P. D. (1994). "The impact of appraisal, locus of control, and level of exposure on the computer anxiety of novice computer users". Journal of Educational Computing Research, vol. 10, no. 4, pp. 329-340.

Dexter, S., Seashore, K.R. & Anderson, R.E. (2002) Contributions of Professional Community to Exemplary Use of ICT. *Journal of Computer Assisted Learning*. 18, pp. 489-497.

Farrell, G. (2007). *Survey of ICT in Education in Kenya*. Washington, DC: infoDev/World Bank.

Francis, L. J., Katz, Y. J., & Jones, S. H. (2000). "The reliability and validity of the Hebrew version of the Computer Attitude Scale". Computers & Education, vol. 35, no. 2, pp. 149-159.

Government of the Republic of Kenya (GoK). (2006). *The Kenya Education Sector Support Program.* Nairobi: Government Printers.

Hattie, N. J. (1992). Self-concept. Hillsdale, N.J: L. Earlbaum Associates, pp 23.

Huitt, W. (2004). "Self-concept and self-esteem". Educational Psychology Interactive. Retrieved September 2, 2009, from http://chiron.valdosta.edu/whuitt/col/regsys/self.html

Jamieson-Proctor, R. M., Burnett, P. C., Finger, G., & Watson, G. (2006). ICT integration and teachers' confidence in using ICT for teaching and learning in Queensland state schools. *Australasian Journal of Educational Technology*, *22*(4).

Keengwe, J., & Onchwari, G. (2008). Constructivism, technology, and meaningful learning. *Handbook of research on instructional systems and technology*, 51-64.

Kiptalum G.K. & Rodrigues, A.J. (Internet Utilization: A Case of Connected Rural and Urban Secondary Schools in Kenya. International Journal of Computing and ICT Research, Vol. 4, No. 1, June 2010

Lau, B. T., & Sim, C. H. (2008). Exploring the extent of ICT adoption among secondary school teachers in Malaysia. *International Journal of Computing and ICT Research*, *2*(2), 19-36.

Makau, B. M. (1990). Computers in Kenya's secondary schools. Case study of an innovation in education, International Development Research Centre (IDRC), Canada.

Malle, B. (1999). "Self-concept: An introduction". Accessed September 15, 2009 from. http://darkwing.uoregon.edu/~bfmalle/410/L1_99.html

Miima, F. Ondigi, S.R. & Mavisi, R. (2013). Teachers' perception about integration of ICT in teaching and learning of Kiswahili language in secondary schools in Kenya. *International Journal of Arts and Commerce*, *2*(3) (March 2013)

Ministry of Education, Kenya, (2006). *National Information and Communication Technology (ICT) Strategy for Education and Training*. Nairobi: The Government Press.

Namlu, A., & Ceyhan, E. (2002). "Computer anxiety: A study on university students". Eskisehir: Anadolu University Publishing.

Necessary, J. R., & Parish, T. S. (1996). "The relationships between computer usage and computer-related attitudes and behaviours". Education, vol. 116, no. 3, pp. 384-388.

Newhouse, C. P. (2001). Applying the concerns-based adoption model to research on computers in classrooms. *Journal of research on technology in education*, *33*(5), n5.

Norris, C., Sullivan, T., Poirot, J., & Soloway, E. (2003). No access, no use, no impact: snapshot surveys of educational technology in K# x2013; 12. *Journal of Research on Technology in Education*, *36*(1), 15-27.

Ogembo, J. O. (2012). Determinants of students' poor performance in chemistry in public secondary schools in Kwale County, Kenya. A Thesis submitted in partial fulfilment for the award of the degree of Master of Education in the School of Education, Kenyatta University, Kenya.

Oredo, J. O. (2008). A framework for evaluating ICT use in teacher education. A case study of the primary teacher training colleges in Kenya. A dissertation submitted to Strathmore University in partial fulfilment of the requirement of the degree of Master of Science in Information Technology.

Russell, G., and Bradley, G. (1997). Teachers' computer anxiety: Implications for professional development. *Education and Information Technologies*, vol. 2, pp.17-30. Sabzian, F. & Gilakjani, P.A., (2013). Teachers' attitudes about computer technology training, professional development, integration, experience, anxiety, and literacy in English language teaching and learning. *International Journal of Applied Science and Technology, 3* (1); January 2013

Taneri, P. O., & Seferoglu, S. S. (2013). Instructional use of information technologies teachers' resistance to the use of new technologies. *International Journal of Technologies in Learning. 19*(3). 60 – 68.

Teo, T. (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal* *of Educational Technology*, *24*(4).

Tsai, M., & Tsai, C. (2003). "Students computer achievement, attitude and anxiety, the role of learning strategies". Journal of Educational Computing research, vol. 28, no. 1, pp. 47-61.

Twoli, N. (1986). Sex differences in science achievement among secondary school students in Kenya. Unpublished doctoral thesis. Flinders University, Australia.

Unwin, T. (2004). Towards a framework for the use of ICT in teacher training in Africa. *The Journal of Open and Distance Education.* Special issue on open learning in less developed countries pg. 8

Wambui, M., & Barasa, E. (2007). ICT: dawn of a new era. *Elimu News: a newsletter of the MoEST*(1).

Wanjira K. (2009). Educational development in Kenya and the role of information and communication technology. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* 2009, 5 (2), pp. 6-20

Yaghi, M., & Ghaith, G. M. 2002. "Correlates of computing confidence among teachers in international setting". Computers in the Schools, vol. 19, no. 1/2, pp. 81-94. Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for classroom technology innovations. *Teachers College Record, 104*(3), 482-515.

Appendix

Table 1: Means, Standard Deviations and Correlations between the Variables of the Study (N = 82)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9
1.Gender	-	-	-	-.093	.206	.331**	.233*	-.068	.263*	-.062	-.306**
2. Level of Educ.	4.52	1.21	-	-	-.005	-.132	-.018	-.054	-.245*	.305**	.051
3. Experience	1.76	1.12			-	.170	-.132	-.076	.152	.037	-.179
4. Area of specialisation	-	-				-	-.011	.097	.277*	.255*	.262*
5. Workload	1.67	1.20					-	-.091	-.099	.191	.262*
6. Training in IT	1.19	.393						-	.142	.233**	-.130
7. Computer attitude	19.30	3.38							-	.016	.477**
8. Computer anxiety	26.34	2.35								-	.006
9. Self – concept	32.65	2.44									-

Table 2: Summary of Results from Regression Analysis of Variables on Willingness to Integrate ICT

Variables	B	β	t	p	R^2	Adj.R^2	R^2 change
Gender	-.043	-.017	-.128	.899	.000	-.017	.000
Qualification	.373	.472	4.041	.000	.223	.196	.223
Experience	.011	.009	.074	.941	.223	.181	.000
Area of spec.	.156	.171	1.279	.206	.245	.191	.022
Workload	.149	.067	.534	.596	.249	.180	.004
Training in IT	.022	.005	.029	.977	.249	.164	.000
Computer Att.	.587	.358	3.227	.002	.148	.134	-
Computer Anx.	-.144	-.133	-1.040	.303	.018	.001	-
Self – concept	-.031	.208	1.057	.296	.311	.187	-

CLOUD COMPUTING AND ITS APPLICATION IN TUTORIAL MANAGEMENT: AN ACTION RESEARCH APPROACH

Henry O. Ayot
Kenyatta University
hoayotk@yahoo.com

John K. Thuku
Kenyatta University
Thuku.john@ku.ac.ke

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Cloud computing is a recent technology that help organizations use third party internet-based servers and computing services to manage their operations without necessarily building and maintaining the networking infrastructure. Universities in Europe, America and Asia have gradually migrated some of their systems to cloud computing with great success. Indeed research show that where cloud computing has been adopted there exists many opportunities that improve teaching, learning and management at Universities. Unfortunately many educational institutions particularly in Kenya are not able to take full advantage despite the low costs involved, flexibility in access points and ease to integrate a wide range of devices such as ipads, phones and laptops that are accessible to students and tutors. To this end, there is need for research that identifies the potential areas of application and also on the systems that work in education process. This paper explores the need for action research in integrating cloud computing in tutorial administration and group discussions as a strategy to enhance interactivity and participatory in learning. It gives an overview of functionalities of E-learning systems and how group tutorials are suitable prototypes. Finally the paper explores how Kenya, as nation in the region, is ready to embrace cloud computing in e-learning systems.

Keywords: Group Tutorial Management, Cloud Computing, Learning Management Systems

Introduction

Cloud computing is fairly recent technology that help organizations use third party internet-based servers and computing services to manage their operations without necessarily building and maintaining the networking infrastructure. Learning institutions are able to deliver courses without necessarily worrying about the underlying architecture and technical issues. It offers a cost effective, scalable and flexible system for both students and education service providers (Sandhu & Sood, 2015).

The potential for adopting cloud computing in learning systems is so attractive that learning institutions do not have any justification to be left behind. At any operational level it is important to understand about the underlying opportunities and benefits. Institutions should take research initiatives to identify requirements and explore on the best approach towards implementing cloud computing. There are a number of tasks involved in the process of developing information systems from the time it is first studied to its completion (Morley & Parker, 2011). Therefore a formal study is useful to implement potentially large systems such as e-learning systems that involve different kinds of users. Any kind of conversion to a new ICT-based would take one or a combination of the following approaches:

1. **Direct conversion.** The old system is replaced with the other.
2. **Parallel conversion**. The old and new system run concurrently until sufficient confidence is gained then the old is phased out.
3. **Phased conversion**. A process of gradual implemented by functionalities.

4. **Pilot conversion.** Is where one location within the organization such a campus is identified for implementation. After successful operation then other locations are converted.

Some important research questions arise on the approach to be used, requirements and other uncertainties that emerge during the implementation process. These questions include:

1. Is tutorial management a suitable prototype for e-learning system?
2. What are the requirements for the implementing e-learning systems?
3. Is action research a suitable approach to study and deployment-learning systems that are based in cloud computing?
4. Is the ICT infrastructure in the country ready enough for cloud computing?
5. How ready is the population for embracing cloud computing in learning systems?

What is Cloud Computing?

Cloud computing is defined as an "Internet-based facility that allows users to access shared computer applications, storage and other resources through a network of remote servers as a service" This means that users will not to buy, install nor manage the computer facility and software but rather rent to store, manage and process data. Users of the service access through the Internet using devices such as personal computers, laptops or mobile phones.

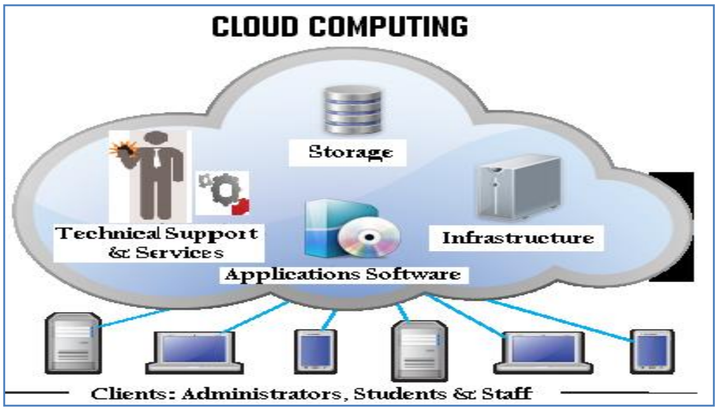


Figure 1: Cloud Computing - Learning Management System

In cloud computing, there are three principle concepts: scalability, flexibility and resource provision as a service.

Scalability

This means the resources such as storage, computer processing power and software functionalities can be scale up or down depending with the customer demands or capability. This factor distinguishes cloud computing with other kind of computing service.

Flexibility and Accessibility

Flexibility is the ability to meet user demands quickly. Cloud computing enable users to access and process data from remote location using any device that connects to the Internet. For example, when a student or an instructor accesses course data from home or from an off-site location, at any time. This certainly enhances flexibility and effectiveness in business.

Resource Provision as a Service

In resource provision the customers are provided with computing resources as a service and not as products. Customers are able to access and use the computing platform and other resources but not own the infrastructure. The responsibility of owing the infrastructure, maintenance and operations for running the system is removed from the user but rather pay as they use.

Business Model for Cloud Computing

The business model for cloud computing has been discussed by various writers. Three categories are identifiable (Diamadi & Pleasance, 2011)., (Taylor, Julisch, & Hall, 2010), (Tan & Kim, 2011):

Infrastructure as a Service (IaaS). Offers computing infrastructure, such as storage, networks, and servers as a service.

Platform as a Service (PaaS). Provides application development tools such as Application Programming Interface (API) and a runtime environment as a service. Computer programmers and web designer use the service to program their own applications.

Software as a Service (SaaS). This model application software is provided as a service. For example, Microsoft Office and Google Docs. The customer will not bother with installation, maintenance or license renewals.

Education systems can save on capital investment and technical support if they hire infrastructure such as computer servers as a service. Other costs and headache in licensing of software, upgrades, storage and security procedures are substantially reduced under the cloud computing business model.

Models of Cloud Computing in Learning Systems

There are three models of cloud computing (Diamadi & Pleasance, 2011) (Bora & Ahmed, 2013)

Private Cloud. Is operated for single organization.

Public Cloud. The service is available to the public and is share by many clients

Hybrid Cloud. Combine private as well as public cloud services though the services distinguishable.

ICT-Based Education Systems

ICT-based educational systems have gradually expanded their scope from a basic content delivery system to big and complex systems that handle numerous functions in learning and teaching process. These kinds of educational/learning management systems are now referred to as electronic learning management systems, or simply e-learning system. Some of the functionalities include:

- Student’s management - registration and enrollment.
- Course management – courses outlines, syllabus.
- Learning material storage and delivery.
- Content production tools.
- Assessment- tutor programmed and self-assessment quizzes.
- Communication; emails, chats, forum and teleconferencing.
- Feedback and performance tracking.
- Integration with human resources and quality assurance modules.
- Administration.
- Reporting.

E-Learning Systems

A Learning Management System (or LMS) is a software package that enables the management and delivery of learning content and resources to students. A basic e-learning system will allow students to register for courses, access to the course and content, and interact with their instructors. More complex systems will have additional tools such as competency management, skills-gap analysis, succession planning, certifications, virtual classes, and resource allocation. A student’s page or portal, that allows learners to access to self-service processes such as enrollment, quizzes, grades and calendar.

In the recent past as ICT becomes available there has been tremendous growth in its application education to give very attractive systems. Many institutions desire to use the best and efficient systems in delivering their learning programmes. Despite the gradual falling of the cost of hardware and software, it has not been easy for many institutions to get it right. This is largely because of the many challenges faced during the deployment process. Some of the challenges include insufficient knowledge on available systems and functionalities, poor project management and conversion skills, and lack of technical support. To get around this, institutions desiring to implement e-learning system should apply the formal process used in information system development. The formal process for system development and implementation involves stakeholder such as administrators, instructors, students and technical experts for guidance and research. This process is referred to as system development life cycle.

System Development Life Cycle

Systems development life cycle (SDLC) is the formal project management process that has a number of stages or phases starting with feasibility study, through system analysis and design, system acquisition, implementation and maintenance. An expert, usually a system analyst or one who is conversant the present system and has ICT knowledge, is involved in all stages.

In the initial stage, the analyst briefly studies the system, identifies the scope and suggests solutions. Also lists benefits and approximate costs. This follows a detailed analysis of the user needs and requirements before a new model for the system is designed. Thereafter acquisition of necessary equipment, hardware and software is done. The next phase is system implementations where the necessary tasks to make the system operational are done. A lot of tests are done at this stage then data conversion, training and plan for system conversion made. Then the final stage is system maintenance, which is an ongoing process.

The entire process of system development is a rigorous exercise that involves all stakeholders. In educational system action research is suitable approach to convert or develop to new systems because it empowers all those involved systems.

Action Research in Deployment E-Learning System

The primary objective of action research is to "identify a specific practice-based problem, and then to undertake research in order to identify the means through which to resolve it" (Henn, Weinstein, & Foard, 2009, p. 66). Action research promotes change, thinking and understanding change by involving those directly affected in altering current practice or developing new practice. In action research, a researcher can isolate a process, function or method that represents areas that need change. E-Learning systems has many functions/ processes; among the key functions are student enrollment, course management, learning material development and delivery, communication and feedback. Group tutorial as a method in learning is a suitable prototype in e-learning implementation.

Group Tutorial Management as a E-Learning System

Group tutorial can represent most functionalities of e-learning system because it covers most of the processes and functionalities. Some of the functions are registration/enrollment to the group, communication, content production and delivery, assessment, grading and feedback. While considering deployment system, tutorial administration is a perfect choice for a prototype approach. There is heavy interaction between primary users who are the students and lecturers all through the process. Therefore any deployment or testing a new system all stakeholders are involved and action research is best approach.

Tan and Kim (2011) have explored cloud-computing application in e-learning, communication and administration within education systems by the main stake holders: faculty, students and administrators (see Table 1 below).

Table 1: Cloud Computing Technologies in Education

Category	Areas where Cloud Computing can be applied	Stakeholders as users of Cloud Computing based application		
		Faculty	*Students*	*Administrators*
e-Learning	Course Contents Management	X	X	
	Collaborative Learning	X	X	
Communication	Email communication	X	X	X
	Notification Management	X	X	X
Administration	Enrollment Management		X	X
	Registration Management		X	X
	HR Management	X		X

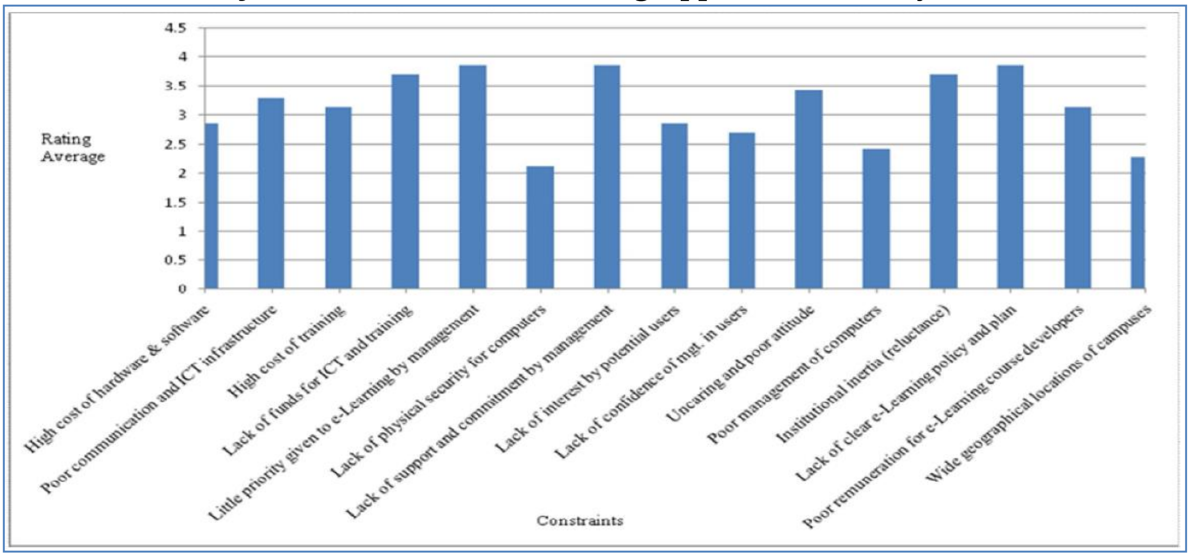
Source: Tan & Kim, 2011, p. 624

Considering the process and activities while conducting learning through group tutorials it is clear that just as in e-learning systems all stakeholders i.e. students, faculty and administrators are involved. The key areas where cloud computing can be used i.e. course content management, communication, enrollment and registration applies also for tutorials. Thus group tutorial is suitable prototype for action research in e-learning deployment. In this study the costs to be incurred can be seen and weighed against benefits and will lead to informed decisions.

Barriers Faced in Implementing E-Learning in Kenya

A recent study by Murage (2013) on the status of e-learning as course delivery in Kenyan public universities listed several barriers that are faced or likely to be faced by public universities in Kenya in dissemination of e- courses, see table below. Ten out of fifteen barriers listed involve infrastructure, maintenance and costs. These barriers are “high cost of hardware and software, poor communication and ICT infrastructure, high cost of training, lack of funds for ICT and training, little priority given to e-Learning by management, lack of physical security for computers, lack of support and commitment by management, lack of interest by potential users, lack of confidence of management in users, uncaring and poor attitude, poor management of computers, institutional inertia (reluctance), lack of clear e-Learning policy and plan, poor remuneration for e-Learning course developers and wide geographical locations of campuses.” (p. 130).

Table 2: Major Constraints in E-Learning Application in Kenyan Universities



Source: Murage, 2013, p. 128.

Ten out of fifteen barriers listed related to infrastructure challenges, maintenance and costs. The benefits of cloud computing include scalability (using resources that you need), no costs for computing equipment apart from end user devices, minimal costs for software and service upgrades(Pocatilu, Alecu, & Vetrici, 2010), no maintenance cost as infrastructure is offered as a service(Tan & Kim, 2011).

Access to Internet and Mobile Phone Service in Kenya

Mobile phones are increasing becoming part of life in Kenya for communication and access to the Internet. According to data from recent quarterly reports for Communications Authority of Kenya there is a general increase in mobile phone subscription and Internet use in Kenya as shown in the table below. For example from January 2013 to December 2014, the mobile subscription rose from 29.8 million to 33.6 million. At the end of the year the mobile penetration was 82.6% of the 40.7 million Kenyans. In the same period the number of Internet users rose to 26.1 million from 23.2 million. This increase placed the Internet penetration at 64.3% of the population.

Table 3: Internet and Mobile Access in Kenya

Service	**Jan-Mar 2013**	**Apr-Jun 2013**	**Jul-Sept 2013**	**Oct-Dec 2013**	**Jan-Mar 2014**	**Apr-Jun 2014**	**Jul-Sept 2014**	**Oct-Dec 2014**
Mobile Subscriptions (million)	29.8	30.5	31.3	31.3	31.8	32.2	32.8	33.6
Mobile penetration percent	75.8	77.3	76.9	76.9	78.2	79.2	80.5	82.6
Local Short Messaging Service (SMS) billion	4.08	4.37	5.05	628	6.22	6.89	6.97	7.29
Data/Internet Subscriptions (million)	9.6		12.4	13.1	13.3	14.0	14.8	16.4
Internet users, estimate (million)	16.4	19.6	19.2	21.3	21.6	22.3	23.2	26.1
Population with Internet Access (%)	41.6	49.7	47.1	52.3	53.3	54.8	57.1	64.3
International internet bandwidth available in the country (Mbps)	921319	862850	862834	862474	865714	847464	847515	847523

Total International Internet Bandwidth Used (Mbps)	307307	356875	360900	365413	447064	436016	478074	498121

Benefits of Cloud Computing in Tutorial Management

There are many advantages in using cloud computing (Sharma, Goyal, & Singh, 2014):

1. Low cost.
2. Scalability. Thus one accesses resources needed as it is quiet easy to upscale or down scale ICT resources as when it is necessary.
3. Improved Availability
4. Improved Updates of Software.
5. Reduced Maintenance. Systems are maintained by the provider.
6. Participation among students
7. Better communication to student.
8. Security of Data

Challenges of Using Cloud Computing

A few challenges in cloud computing include:

1. Privacy and security of data and information stored offsite.
2. Reliability of bandwidth
3. Rivalry and Malicious Interferences

Conclusion

Cloud computing is an important technology that enable all kinds of organizations, big or small, to scale down on their requirements in adopting ICT, save on infrastructure and technical costs and access to the modern ICT applications and tools. However, educational institutions often face challenges to migrate from older systems to cloud based mainly due to uncertainties. This paper advocates that for action research in guiding successful migration process for educational institutions from old to new system. Considering that cloud computing is a recent technology it is worthwhile to isolate certain procedures or functions that are representative enough for a pilot. Tutorials adequately represent e-learning system as most of key functions are covered; these are student enrollment, course management, development and delivery of learning materials, communication and feedback. Cloud computing has its niche is renting rather than capital investment so it is critical that local infrastructure and Internet access can support the model. Data available about Kenya indicates that the country is ready and learning institutions can adopt cloud computing.

References

Bora, U. J., & Ahmed, M. (2013). E-Learning using Cloud Computing, (2), 9–13.

Diamadi, Z., & Pleasance, D. (2011). Winning in the SMB Cloud : Charting a path to success, (July).

Henn, M., Weinstein, M., & Foard, N. (2009). *A Critical Introduction to Social Research* (Vol. 18). SAGE Publications.

Morley, D., & Parker, C. S. (2011). *Understanding computers: today and tommorow* (13th ed.). Cengage Learning.

Murage, M. N. (2013). *Assessment Of The Status Of E-Learning As Course Delivery Method In Public Universities In Kenya*. Kenyatta University.

Pocatilu, P., Alecu, F., & Vetrici, M. (2010). Using Cloud Computing for E-learning Systems. In *8th WSEAS International Conference on DATA NETWORKS, COMMUNICATIONS, COMPUTERS* (Vol. 9, pp. 54–59).

Sandhu, R., & Sood, S. K. (2015). A commercial, benefit driven and secure framework for elearning in cloud computing. *Computer Applications in Engineering Education*, n/a–n/a. doi:10.1002/cae.21621

Sharma, S. K., Goyal, N., & Singh, M. (2014). Distance Education Technologies : Using E-learning System and Cloud Computing, *5*(2), 1451–1454.

Tan, X., & Kim, Y. (2011). Cloud Computing for Education: A Case of Using Google Docs in MBA Group Projects - 4464a641.pdf. In *2011 International Conference on Business Computing and Global Informatization*. IEEE Computer Society. doi:10.1109/BCGIn.2011.169

Taylor, P., Julisch, K., & Hall, M. (2010). Security and Control in the Cloud. *Information Security Journal: A Global Perspective*, *19*(6), 299–309. doi:10.1080/19393555.2010.514654

EFFECTS OF MATHEMATICAL VOCABULARY INSTRUCTION ON STUDENTS' ACHIEVEMENT IN MATHEMATICS IN SECONDARY SCHOOLS OF MURANG'A COUNTY, KENYA

Benson N. Wanjiru
Kenyatta University
wanjiruben@gmail.com

Marguerite Miheso-O'Connor
Kenyatta University
Miheso.marguerite@ku.ac.ke

Sophia Ndethiu
Kenyatta University
ndethiums@gmail.com

This article is based on a study whose main objective was to determine the effects of mathematical vocabulary instruction on students' achievement in Mathematics in Secondary schools in Murang'a County, Kenya. The study was a non-equivalent control group pretest-posttest quasi-experimental design and was conducted in the two purposively selected secondary schools in Kahuro District in Murang'a County, Kenya. Both the experimental and the control groups consisted of fifty-four (54) students from each school. The experimental groups were exposed to mathematical vocabulary instruction using the Graphical Organizer based on the Frayer Model with ICT integration instructional approach for ten (10) weeks. The control group was taught mathematical vocabulary by the definition-only method for the same period. Data were analysed using one-way ANOVA, independent t-test and paired t-test. The findings indicated that there is a statistically significant mean difference in the students' performance in Mathematics for the group taught Mathematics vocabulary using the Frayer Model and those taught Mathematics using the definition-only method.

Key words: Mathematics Vocabulary Instruction, Frayer Model, Mathematics Vocabulary

Introduction

Mathematics is one of the key subjects offered in the Kenyan secondary school curriculum. Due to value afforded to mathematics by the society, the subject has been made compulsory for all learners until the end of the secondary school course. Despite the importance to which the society values mathematics, the performance of the students in the annual National secondary school examination (KCSE) has been dismal. In this paper we show posit that a key component in understanding mathematics is learning mathematics vocabulary. Mathematical vocabulary refers to words that label mathematical concepts for example quotient, volume, vertex, dividend, and hexagon (Sanders, 2007). According to Miller (1993) students are likely to be handicapped in their effort to learn mathematics if they do not understand the vocabulary that is used in mathematics classrooms, textbooks and assessment tests. One of the obstacles that make mathematical vocabulary difficult to learn is lack of opportunity (Paul & Sinha, 2010). This is because much of the vocabulary used in mathematics classroom is rarely encountered in everyday life. In addition, mathematics teachers often neglect meaningful vocabulary instruction. Also, many terms have meanings in the realm of mathematics that differ from their meanings in everyday usage (Njoroge, 2003).

Without appropriate vocabulary instruction, students are likely to experience difficulties and interference in the learning of concepts for which they have background knowledge that appears unrelated to mathematics. Students need to know the meaning of mathematics vocabulary words-whether written or spoken-in order to understand and communicate mathematics ideas. According to Sanders (2007), terms, phrases, and symbols are essential in communicating mathematical ideas; and becoming fluent with them is vital for children's mathematical learning. Research reveals that the knowledge of mathematics vocabulary directly affects achievement in arithmetic, particularly problem-solving (Staley, 2005). Riordain and O'Donoghue (2009) indicated that vocabulary knowledge is strongly related to overall academic achievement in school. Although students may excel in computation, their ability to apply their mathematics skills will be hindered if they do not understand the vocabulary required to master content and able to apply in future situations. Thus teaching vocabulary in the mathematics content area is a critical element of effective instruction.

Although Mathematics is a visual language of symbols and numbers, it is expressed and explained through written and spoken words. Thus, for students to excel in Mathematics, they must recognize, comprehend and apply the requisite mathematical vocabulary. Teaching mathematical vocabulary words solely as definitions as is the practice in most Kenyan schools does not assist students in comprehending the word when found in Mathematics textbooks and examination items. Students must be actively engaged in building background knowledge using key content-specific vocabulary. This paper is based on findings from a study that was carried out in Murang'a County, Kenya to determine the effects of Mathematical vocabulary instruction on students' achievement in Mathematics.

The study**,** "Effects of Mathematical Vocabulary Instruction on Students' Achievement in Mathematics in Secondary School" was carried out in Murang'a County, Kenya by the first author. The objective of the study was to determine the extent to which mathematical vocabulary instruction influence students' performance in Mathematics and the following null hypothesis was used to answer the research question; $H_0 1$: There is no significant difference between students' performance in Mathematics for students taught Mathematics vocabulary using the Frayer Model with ICT integration and those taught mathematical vocabulary using the definition-only method.

Methodology

The study employed a non-equivalent control group pretest-posttest quasi-experimental design. According to Wiersma and Jurs (2005), a nonequivalent control group pretest-posttest quasi-experimental design is suitable when intact groups of participants are used in an experiment rather than assigning participants at random to experiments treatments. The design was found to be suitable because as Mugenda (2008) notes the administrators in educational institutions do not allow dismantling of the intact classes so as to allow for random assignment.

The notational paradigm of the design can be summarized as shown below:

Experimental Group	O_1	X	O_3
Control group	O_2	x	O_4

Key: O_1 and O_2 represent the pre-test observations, X-Mathematics Vocabulary Frayer Model with ICT integration, -Mathematics Vocabulary Instruction using the definition-only method, O_3 and O_4 represent post-test observations for the experimental and control groups respectively. The dashed line separating the parallel rows in the diagram indicates that the experimental and control groups have not been equated by randomization (Cohen, Manion and Morrison 2011).

The independent variables were the mathematical vocabulary teaching strategies while students' performance in Mathematics formed the dependent variables. The teaching strategies for this study were the Frayer Model with ICT integration for the experimental group and the definition-only for the control group.

The study sample consisted of two Secondary Schools in Kahuro District, Kiharu Constituency of Murang'a County, Kenya. The schools were purposively chosen. The choice of the two schools was informed by the fact that they are in the same administrative Location, get students from the same catchment area, score almost equal Mean Standard Scores in KCSE, have similar facilities and are accessible in terms of communication. Moreover, the schools were equipped with ultra-modern computer laboratories where students in the experimental group could access the mathematics dictionary by Jenny Eather at www.amathsdictionaryforkids.com.

Simple random sampling technique was used to select two out of the 4 Form Two classes in the boys' school. Similarly, two out of the 5 Form Two classes in the girls' school were randomly selected. Census strategy was used in the selection of the participating students. A sample of 108 Form Two students from each school was selected for the study giving a total study sample of 216.

The 216 study participants responded to a Pre-test Mathematics test. The study involved teaching the control and experimental groups mathematical vocabulary using different strategies. Participating teachers were trained on how to use the Frayer model. The presentation rate was one word per lesson to a total of ten items for the study similar to the one employed by other research implementation studies (Mastropieri, Sweda & Scruggs, 2000; Sander, 2007). The two control groups were taught the 10 Mathematics vocabulary words for a period of ten weeks between May and July 2013 using the definition-only strategy The other two experimental groups were taught 10 Mathematics vocabulary words for the same period but using the Frayer Model with ICT integration strategy. The students from all the groups were given The Mathematics Vocabulary Dictionary (SMVD) during the lesson and collected after. Guiding notes for the lesson planning for teaching Mathematical vocabulary were developed by the researcher with collaboration of experts in Mathematical Education from Kenyatta University and CEMASTEA. The lessons for the experimental group were taught in the Computer Laboratory and students were allowed to access the site: http://www.amathsdictionaryforkids.com in the course of the lesson. The control group was also taught one lesson per week in the computer laboratory but did not access the site. The trained teachers, per lesson per week, taught one vocabulary. The 10 vocabularies were taught for 10 weeks. After the 10 weeks, the study participants responded to the Post-Test Mathematics Achievement Test, POSMAT.

In order to achieve the objective and increase reliability of findings, the study employed five (5) instruments namely: Pre-test Students' Mathematics Vocabulary Test (PRESMVT), Posttest Students' Mathematics Vocabulary Test (POSMVT), Students' Mathematical Vocabulary Dictionary (SMVD), Pretest Students Mathematics Achievement Test (PRESMAT) and Posttest Students Mathematics Achievement Test (POSMAT). The Pre-test Students' Mathematics Vocabulary Test (PRESMVT) constituted five (5) Mathematical words drawn from Form One Mathematics syllabus. To determine target vocabulary for this study, the following rigorous procedure was used to select the five words for the PRESMVT. First Mathematics teachers in the study location were requested through an email to identify from their experience, problematic words from the 8.4.4 curriculum, Form One syllabus. The initial suggestions were combined and mailed out again, this time with a rating scale. Teachers rated the difficulty level of each word on a scale of 1-5.

1. Not a problem
2. A small problem
3. Sometimes a problem when used in certain contexts
4. Always a problem
5. A major difficulty to most of the learners

The teachers also rated the words according to their impact on test success. (1) No impact on test scores (2) small impact on test success (3) some impact on test success (4) big impact on test success (5) a major impact on test success. The rating depended on their perception of how the word would influence success rate of a student to get a question right if the word appeared in a question. The scores from each of these categories were averaged and then both averages were added together to form a composite score. The total score for each word was calculated and the words rank ordered. The teachers then received another email asking for their final input. The most top-scoring words on the final list were removed and others were also removed due to the difficulty in representing in a picture or diagram. The final selection lists of 15 vocabulary terms were emailed to the teachers. They included 1 Product, 2 Factors, 3 chord, 4 polygon, 5 degree, 6 scale, 7 power, 8 area, 9 integer, 10 multiple, 11 perimeter, 12 capacity, 13 ratio, 14 angle, 15 percentage.

Five vocabulary words were used for the pre-test survey while 10 were used for the post-test survey. This included perimeter, percentage, capacity, ration and angle. Students were required to define the word, use the word in a sentence and draw a picture or diagram that visually represents the meaning of the word. Each attracted one mark totaling to fifteen 15 marks.

The Pre-test Students' Mathematics Achievement Test (PRESMAT) aimed at determining students' application of Mathematical vocabulary in answering Mathematical questions. It was constructed with some items adapted from KNEC (2008, 2009 & 2010). It consisted of 5 Mathematical problems applying the 5 Mathematical Vocabularies of the PRESMVT. A table of specification was drawn and the items written following Bloom's levels of cognitive taxonomy. The five questions were from each of the five levels. Each question scored a maximum of 3 marks totalling to 15 marks.

The Post-test Students' Mathematics Achievement Test (POSMAT) also aimed at determining students' application of Mathematical vocabulary in answering Mathematical questions. It was constructed with some items adapted from KNEC (2008, 2009 & 2010). It consisted of ten (10) Mathematical problems applying the ten Mathematical Vocabularies of the POSMVT. A table specification was drawn and the item written following Bloom's levels of cognitive taxonomy. There were two questions from each of the first five levels. Each question scored maximum of three marks totalling to 30 marks. It was administered to the students in a staggered manner, each at the end of the day after the lesson for the ten weeks. Scores of the ten tests were compiled for each student at the end of the ten weeks.

Data germane to the study was both quantitative and qualitative. Quantitative data were analysed using Statistical Package for Social Sciences (SPSS) Version 21.0. Quantitative analysis involved presentation of statistical data in form of frequency distribution tables whose explanation was mainly descriptive and inferential statistics. The analysis focused on comparing the mean scores of students' performance in the POSMAT for those exposed to the Frayer Model and those exposed to the conventional method. The statistical significance of the results was then examined at $\alpha = 0.05$ statistical confidence level. Quantitative data was further analyzed using independent t-test, paired-t-test and 2-way ANOVA. Student's t-test was used to compare the means in student's performance in the Mathematics Achievement Test between the experimental and control groups. Qualitative data was analyzed thematically whose main focus was to determine the strategies for mathematics vocabulary instruction.

Results

The study performed a paired samples t-test for the four groups between pre-test and post-test.

Table 1. Paired Samples t-test for the Four Groups between Pre-test and Post-test

Group	**N**	**Pre-test**		**Post-test**		**Paired mean difference**		**T-test**		
		Mean	SD	Mean	SD	Mean	SD	t	Df	Sig. (2-tailed)
Boys Exp	54	5.28	3.212	9.57	5.812	4.296	6.512	4.848	53	.000
Boys Control	54	6.02	2.798	6.78	2.912	0.759	2.480	2.250	53	.029
Girls Exp	54	5.80	2.131	8.70	3.298	2.907	3.997	5.356	53	.000
GirlsControl	54	5.78	2.508	6.65	2.283	0.870	3.172	2.015	53	.049

The results (Table 1) shows that there was a significant mean gain in all groups between pre-test and post-test; Boys experimental (mean gain= 4.296, t (53) = + 4.848, $\rho > .0001$), Boys Control (mean gain = + 0.0759, t (53) = + 4.848, $\rho = .029$), Girls experimental (mean gain = + 2.907, t (53) = 4.848, $\rho > .0001$) and Girls control (Mean gain = + 0.870, t (53) = 4.848, $\rho = .049$). This can be explained by the fact that mathematics vocabulary instruction whether by definition only or by the Frayer model contributes significantly to students performance in Mathematics.

In order to test if there is any significant difference between students' performance in Mathematics for students taught Mathematics vocabulary using the Frayer model with ICT integration and those taught using definition-only method, an independent t-test was performed.

Table 2. Independent t-test for Students Performance in Post-test Mathematics test

Group	*n*	*Mean*	*SD*	t	Df	Sig. (2-tailed)
Boys Experiment	54	9.57	5.826	-3.155	106	.002
Boys Control	54	6.78	2.912			
Girls Experiment	54	8.70	3.289	-3.773	106	.000
Girls Control	54	6.65	2.283			

The results (Table2) indicated that that boys experimental group (*M* = 9.57, *SD* = 5.826) performed better than the boys control group (*M* = 6.78, *SD* = 2.912) in the post-test Mathematics achievement test (POSMAT). On the other hand, the girls experimental group (*M* = 8.70, *SD* = 3.298) performed better than the girls control group (*M* = 6.76, *SD* = 2.283) in the post-test Mathematics achievement test. The study shows that there is a statistically significant mean difference between boys experimental and the boys control group, absolute t (106) = 3.155, $\rho = .002$. Also, it shows that there is a statistically significant mean difference between the girls experimental and girls control groups, absolute t (106) = 3.773, $\rho > .0001$. A Tukey's H*SD* post hoc test revealed that there was a statistically significant mean difference between the mean scores of the POSMAT between the boys control and the boys experimental groups ($\rho = .001$) and the girls control and the experimental groups ($\rho =.001$). The study hypothesis, H_01, *there is no significant difference in students' performance in Mathematics between students taught Mathematics vocabulary using the Frayer model with ICT integration and those taught using definition-only method* was rejected. The alternative hypothesis, H_3 was accepted. Thus, the study concluded *that there is a statistically significant mean difference between the students' performance in Mathematics for students taught Mathematics vocabulary using the Frayer Model with ICT integration and those taught mathematical vocabulary using the definition only method.* The effect size, r = 0.1875 obtained indicated a small effect size.

Conclusions

The study found that the Frayer Model when integrated with Technology provided better opportunities for learners to understand the interaction with mathematics content. The study concluded that a well-developed and executed mathematics vocabulary instruction could effectively improve students' achievement in Mathematics. It also concluded that the use of graphical organizers based on the Frayer model with ICT integration is an effective method for Mathematics vocabulary instruction. The method is a cognitively guided instructional strategy. It involves three broad steps. The first step is the *Introduction stage*. Here, the teacher presents the mathematical vocabulary that might be confusing because of its relational qualities or one to be encountered in a topic. The teacher then divides the class into groups, provides materials and worksheets. The teacher then explains the Frayer model diagram to the learners. The second step is the *Development stage*. The learners find the examples, non-examples, facts and characteristics of the vocabulary to complete the diagram. They also use textbooks, login in the Internet and other supplementary materials to aid in the exercise. They then makes foldable of the word. Once their diagrams are complete, the various groups make their presentations. The teacher harmonizes the results from the groups. The last stage is the *Conclusion stage*. It is the closure stage. In this step, the review of the lesson is done. Exercises for further activities are also given.

References

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th Ed). London: Routledge. http://www.amathsdictionaryforkids.com

Marzano, R. (2004). *Building background knowledge for academic achievement research on what works in school*. Alexandria: Association for supervision and curriculum development.

Mastropieri, M.A., Sweda, J., and Schruggs, T.E. (2000). *Teacher use of Economic Strategy instruction. Learning disabilities & practice, 15*(2) 69-74

Miller, D. L. (1993). Making the connection with language. *Arithmetic Teacher, 40*(6), 311–316.

Monroe, E. E., & Pendergrass, M. R. (2002). Effects of mathematical vocabulary instruction on fourth grade students. *Reading Improvement, 32,*120–132.

Mugenda, A. G. (2008*). Social Science Research. Theory and Practice*. Nairobi: ARTS

Njoroge, B. (2003). The Relationship between Mathematical Language and Students' Performance in Mathematics in Nairobi Province, Kenya. Unpublished M.Ed Thesis, Kenyatta University, Nairobi.

Paul, M. & Sinha, A. (2010). Effect of proficiency in English on the performance of B. Tech students in group discussion. In *African Journal of Business Management* vol. 4(8)

Riordain, M. N., & O'Donoghue, J. (2009).The relationship between performance on Mathematical word problems and language proficiency for students learning through the medium of Irish. *Education Studies Mathematics, 71*; 43-64

Sanders,S.P. (2007).Embedded strategies in mathematics vocabulary instruction: A quasi-experimental study. Published PhD dissertation. Clemson University.

Solano-Flores, G, & Trumbull, E. (2003). Examining language in context: The need for new research and practice paradigms in the testing of English-language learners *Educational Researcher*, 32(2), 3-13.

Staley, L.E (2005). *The effects of English language proficiency on students' performance on standardized test of mathematics achievement.* Published PhD dissertation. Los Angeles: University of California

Wiersma, W. & Jurs, G. S. (2005). *Research Methods in Education: An introduction* (8thed.) Boston: Pearson

AN ANALYSIS OF UNDERGRADUATE STUDENTS' UNDERSTANDING OF THE CONCEPTS OF CONTINUITY AND DIFFERENTIABILITY

Peter Chifamba
University of Kwazulu Natal
peterchifamba@yahoo.co.uk

This study was an attempt to understand some of the learning obstacles encountered by students when learning the concepts of differentiability and continuity in Real Analysis at undergraduate level. The study is qualitative in nature and takes on the form of a case study of a group of 13 B. Ed in -service teachers majoring in mathematics at Great Zimbabwe University. The framework used for the design of the study and the analysis was the APOS theoretical framework. The research instrument used in this study was an assessment task with questions on continuity and differentiation. . The study found that most students showed that they did not have appropriate mental structures for the concepts at process, or object level. It is recommended that students should be given opportunities of working with different representations of the functions to facilitate their understanding of these abstract concepts

Key words: Continuity, Differentiability, APOS Theory Framework

Introduction

The mathematics curriculum for Bed In -service honours program at Great Zimbabwe university has 21 modules in mathematics and mathematics education. Real analysis is offered as a second year module after having covered linear algebra, abstract algebra and advanced calculus at part one level, while complex analysis is done at part three. Most of the concepts in other areas of mathematics are an extension of real analysis ideas such as limits, continuity and differentiability. A strong background of these concepts is necessary in any undergraduate mathematics curriculum. Experience and work by other researchers show that learners have difficulties with some concepts in real analysis and that they tend to memorise lecture notes and reproduce theorems in order to pass the exam. This research looks at how students understand the concepts of continuity and differentiability. Similar research has been done in calculus for differentiation by Maharaji (2013), Orton (1983), Uygur and Ozdas (2005) who noted that learners have certain difficulties with the derivative concept and that students cannot explain why rules of differentiation work. Hlankioniemi (2004) noted that students' understanding of the derivative improves if several kinds of representations are used, while Zandieh (2000) noted that learners prefer graphical representations when dealing with properties of functions. This research will consider learning difficulties of the concepts of differentiability and continuity in real analysis where conceptual knowledge should be demonstrated.

Literature Review

Research points out that undergraduate students have difficulties in understanding certain concepts in real analysis Tall (1991). A majority of students at university level simply memorize proofs and pass the examination (Sawyer 1987). If the students are asked to perform the same tasks a few weeks after the examination, they may have forgotten. Artigue (1987, cited in Tall, 1991) reported that learning analysis presents problems that are due to some of the following factors, the highly sophisticated level of the concepts e.g. sequences and functions, the formalization of analytic definitions to provide rigor in the course, and difficulties posed in learning specific technical terms in the course such lower and, upper bounds and axiom of completeness.

Several abstract and theoretical topics have to be developed over a very short period of time such as a semester, the concepts are closely related by the limit concept which most learners have difficulties with, The use of $\varepsilon - \delta$ definition of some concepts such as limits and continuity may not be easy to comprehend as this approach involves a lot of rigor Also the ideas were developed over a long period of time and most of them were a result of providing answers to specific classical problems and yet undergraduate students are expected to understand them in a very short period of time such as a one hour lecture.

The conceptual field of analysis is wide and at elementary level is structured around real numbers, functions, limits of sequences and functions, continuity, differentiation and the Riemann integral. A satisfactory discussion of the main concepts of analysis such as convergence, continuity, differentiation and integration must be based on an accurately defined number concept. Rudin R. (1976)

The concepts of continuity and differentiability are at the center of the course. Integration is ant -differentiation, and applications of differentiation are very wide e.g. rates of change, velocity and acceleration and partial derivatives .The relationship between the two concepts of differentiability and continuity is central in certain theorems. Differentiability implies continuity and a counter example can be used to prove that the reverse is not true. Certain results e.g. Rolles' theorem and the Mean Value theorems are centered on a function that is both differentiable and continuous on an interval.

Rolles' theorem states that suppose a function f is continuous on [a ,b] and differentiable on (a ,b) and suppose f(a) = f(b), then there exist c in (a.b) such that f(c) =0. Rolles' theorem leads to the Mean Value Theorems.

The concept of continuity is defined in terms of limits: A function f(x) is continuous at x_0 iff given any $\varepsilon > 0$, there exist $\delta > 0$ such that $|x - x_0| < \delta$ implies $|f(x) - f(x_0)| < \varepsilon$. This definition is an abstraction of the definition of continuity in terms of limit f (x) as x approach $x_0 = f(x_0)$. These two definitions are equivalent. A function is continuous on a set A if it is continuous at each point in A. The notion of continuity has several applications and leads to some of the following results: uniform continuity, differentiation and integration. Every differentiable function is continuous.

Differentiability has been characterized in terms of:

1. Limits e.g. $f^{/}(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ i.e. a function f(x) is differentiable at a point x_0 if this limit exist at $x = x_0$.
2. Left hand and right hand derivatives i.e. a function f(x) is differentiable at x = a if the left hand derivative is equal to the right hand derivative at the point.

Both continuity and differentiation are concepts expressed in terms of limits of functions. Vuma (1998) asserts that in complex analysis the concepts of continuity and differentiability are defined in the same way as in real analysis and different authors use different terms to describe functions that are differentiable in the complex sense such as regular, holomorphic, analytic and entire. The limit concept plays a very important role in mathematical analysis.

> The mathematical concept of a limit is a particularly difficult notion, typical of the kind of thought required in advanced mathematics. It holds a central position which permeates the whole of mathematical analysis-as a foundation of the theory of approximation, of continuity, and of differential and integral calculus. (Corn, 1991, as cited in Tall, 1991, p. 133)

Bezuidenhout (2001) also observed that first year university students held some misconceptions with limits and continuity in a calculus course.

Various views have been expressed on what constitutes mathematical understanding. *To understand something means to assimilate it into an appropriate schema Skemp 1971:46*

The same authority identified two types of understanding namely relational and instrumental understanding Relational understanding is knowing what to do and why while instrumental understanding is possession of rules and the ability to use them correctly. Skemp (1976) Relational understanding involves deriving concepts from first principles and calls for a high level of understanding why a procedure works while instrumental understanding is ability to carry out computational skills. For the concept differentiation a learner who has can differentiate the function f(x) = sinx from first principles i.e. using limits may be considered to have a relational understanding of the derivative of the function while the learner who only know that the derivative of sinx is cosx from a given list of formulas has an instrumental understanding of the concept. Instrumental understanding appears easier to achieve but students may easily forget what they think they have learnt, while relational understanding enables the learner to perform new tasks and concepts are easily remembered. Most topics in real analysis are theoretical and demand the latter type of understanding.

Other researchers suggest that mathematical knowledge held by an individual is either procedural or conceptual. (Heibert & Leiverve, 1986). These researchers define procedural knowledge as competence in carrying out mathematical tasks while conceptual knowledge is knowledge that is rich in connections. This classification of knowledge is similar to Skemps' notions of types of understanding. Nickerson (1985) suggests some characteristics that show that a learner has understood which are, agreement with experts, being able to see deeper characteristics of a concept, looking for specific information quickly and the ability to see connections within several concepts. It may not be easy to have one type of understanding without the other or a certain type of knowledge without the other, but most researchers seem to prefer instruction that promote why procedures work and to show connections between concepts as this promotes deeper understanding of mathematics concept and future learning. Basic notions in real analysis require the learners to have deep insights about them. The concepts of differentiability and continuity are also very abstract in nature and students should have correct concept images and concept definitions. A concept definition gives precisely instances and non-instances of a concept while a concept image is an individuals' perception of the concept. The correct concept image may be formed if the learner is given several experiences of the concept. Dreyfus & Vinner (1989) suggests that concept images are not formed by definitions alone but through experiences.

Statement of the Problem

This research will consider how APOS theory based research can be used to detect the level of understanding of the concepts of continuity , differentiation and their relationship at undergraduate level. It will also suggest possible causes of learning obstacles to the two concepts.

Research Questions

This research will be guided by the following questions:

Major question. What is the state of students' understanding the concepts of continuity and differentiability?

Sub-questions: (a) What are the causes of learning obstacles in the concepts of continuity and differentiability? (b) How can APOS theory be used to overcome the problems?

Research Methodology

Research Design

The case study design will be used because of the nature of the problem under investigation. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real life context especially when the boundaries between phenomenon and context are not clearly evident Yin (1981). A case study is a method of gathering and analyzing data as a way of investigating a conjecture in order to understand a real life problem. A case study can be about a target group of people, individuals or events. The case study is appropriate for this research since it is investigating a particular group of learners' problems in an undergraduate course in real analysis. Case study results are usually suitable for publication and such results relate very well with other researchers in a specific area of research.

Population and Sample

The research was done on a group of 13 in-service Bed students who were majoring in mathematics since the class was very small all students were involved in the research. The students had completed a diploma in education at teachers college level with mathematics as their major subject over a period of 3 years. In addition more than half of the group had an 'A' level pass in Mathematics and the program done at teachers college had also prepared them to teach mathematics up to 'o' level. The teachers college curriculum also has some 'A' level topics such as functions, basic differentiation, integration and trigonometry.

Research Instruments

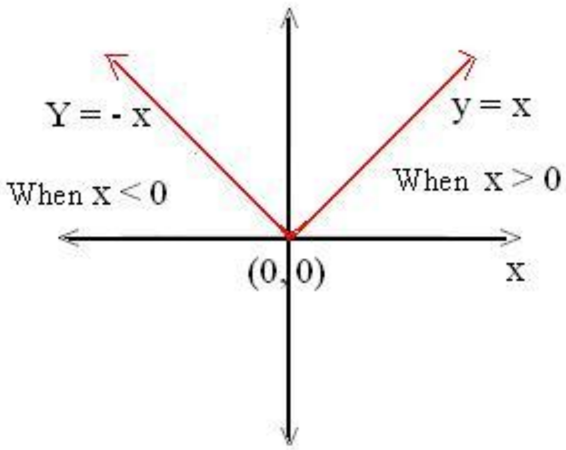
A test was used to collect data from the group about the level of understanding of the concepts of continuity, differentiability and applications after teaching the concepts. The test had 3 tasks on the concepts.

The tasks assessed their ability to sketch the graph of a function, prove continuity on a set and check differentiability at a particular point. This task is usually taken to be the standard counter example proof that continuity does not imply differentiability. Task: Let f(x) = |x| on R.

i. Sketch the graph of f(x).
ii. Prove that f(x) is continuous on R.
iii. Prove that f(x) is not differentiable at (0,0).

Suggested Solutions:

Sketch of graph of the function f (x) = |x|.



(ii) Let $\varepsilon > 0$ be given. We want to find $\delta > 0$ such that $|x - x_0| < \delta$ implies $|f(x) - f(x_0)| < \varepsilon$. Note that for any real numbers a and b, $||a| - |b|| \leq |a - b|$. Therefore $|f(x) - f(x_0)| = ||x| - |x_0|| \leq |x - x_0|$. So choose $\delta = \varepsilon$. Since the δ is a function of ε only this is uniform continuity.

(iv)The left hand derivative at x=0 is -1, while the right hand derivative is +1. Since these two are not equal the function f(x) is not differentiable at x = 0.

Also note that $f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$ which may result that $f'(x) = \begin{cases} 1, & x < 0 \\ -1, & x \geq 0 \end{cases}$

Theoretical Framework

This research was guided by APOS theory (Dubinsky and McDonald ;2001). The theory is an extension of Piagets' work on reflexive abstraction, which is another framework that describes the construction of mathematical structures by an individual during the course of cognitive development. According to Dubinsky (2010) APOS theory and its applications is based on the assumption that an individuals' mathematical knowledge is his/her ability to respond to mathematical problem situations and solutions by reflecting on them in a social context and constructing or reconstructing to use in dealing with the situations. It also has the hypotheses that an individual does not learn mathematics concepts directly. He/she applies uses mental structures to make sense of a concept. The mental structures refer to the likely actions, processes, objects and schemas needed during the learning of a concept. The definitions of the mental structures given below have were given by Weller et al (2009). Related examples on continuity have be suggested.

Actions. An individuals' first experience with a concept is external and may be taken to be an action. A learner who can substitute a value in a function to check continuity of a function at that point has an action understanding of the concept of continuity.

Process. After repeating the action several times a learner may interiorize the action as a process. A learner who can substitute several values of the function near x=a to check continuity of the function f(x) at x=a has understood the continuity idea as a process.

Object. A learner may encapsulate the process into an object. A learner who can draw the correct graph of the function to determine its continuity properties has an object understanding of continuity.

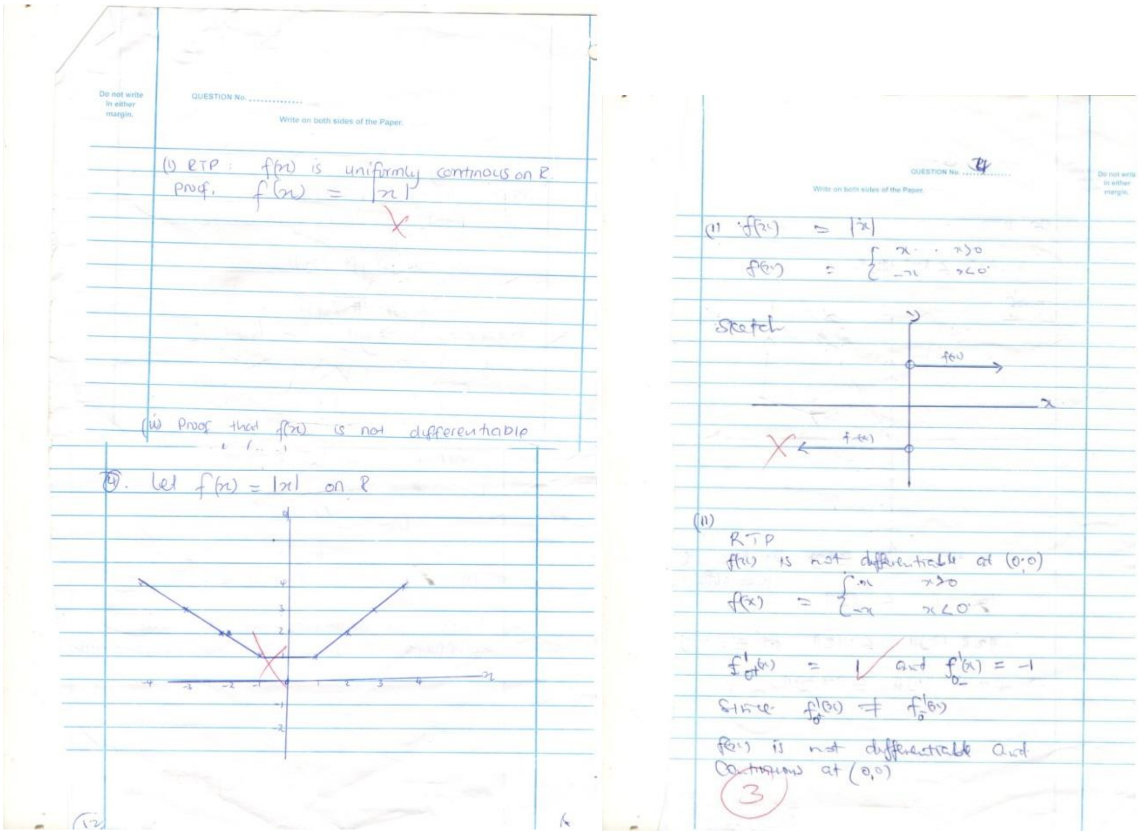
Schema. A mature schema is a final mental image or representation of the concept and other previously developed schemas. It is the final desirable outcome of the collection of actions, processes, objects and other existing schemas. A learner who can who can use the definition of continuity such as use of limits to prove continuity has the appropriate schema of continuity. The main mechanisms for building mental structures action, processes, objects and schema are called interiorisation and encapsulation Dubinsky (2010), Weiller (2009).Piaget and Gracia (1983/1989,1996) explained schema development in terms of the triad.

Researches based on APOS require the instructor to help the students to identify the appropriate mental structures for learning a particular concept and then provide effective learning. Asiala et al. (1996) proposed a framework for APOS theory based research and the framework has 3 components namely theoretical analysis, design, and implementation of instruction and data analysis. In theoretical analysis the researcher predicts the likely mental structures for the concept. This is usually done relative to the researcher's knowledge about the concept. After identifying the likely mental structures appropriate learning materials and activities have to be suggested. After teaching the concept a task can be given to check the level of performance of the learners. Questions in the task may be able to detect the level of performance at action, process, object and schema level. APOS based research has already been used by successfully by other researchers for undergraduate mathematics learning. e.g. Cotrill (1999), the chain rule and its relation to composite functions, Clarke etal (1997) students understanding of the chain rule.

Results

1. Sketch of the graph of $f(x) = |x|$.

This question was meant to check the learner's knowledge of curve sketching of the graph of f(x = |x|. . Two of the students could not give the correct sketch of the graph and one of them did not attempt the question. These individuals had no idea of basic curve properties of $f(x) = |x|$. The two learners who gave incorrect graphs of the function did not even realize that the graph passes through the origin. This shows that the students had a very weak background of graphs of functions and yet functions are central to the concepts under consideration. The incorrect graphs are shown below:



Continuity

2. Prove that f(x) = |x| is continuous on **R**. 9 candidates out of 13 representing 69.2% of the students had incorrect solutions to the task and 4 of these 9 candidates checked continuity at origin and not on **R** and these learners can be considered to be at the action level of understanding the concept. The four did not understand the difference between continuity at a point and continuity on a set. However 4 students used the ε, δ definition correctly demonstrated the process, object and schema understanding of the concept. Most of the group showed that they did not have appropriate mental structures at process object and schema level of the continuity concept on a set. They had the concept of continuity at a point and not on an infinite set or had no idea at all i.e. Pre action level. One student used a table of values, assuming that the real line is a finite set and the individual demonstrated the process level of understanding the concept of continuity.

Differentiability

6 out of 13 candidates (46%) had an idea of differentiability as a technique of computing gradient functions(procedural knowledge) and also at action stage but could not apply the use of left hand and right hand derivatives (object or schema stage) to check whether a function is differentiable or not. The concept of differentiability in analysis is conceptual and not procedural. Learners are expected to prove differentiability of a function and not to differentiate the function. Individuals who showed difficulties with the task demonstrated that they were not aware of these two contexts. Use of left hand and right hand derivatives was correctly done by 5 learners out of the whole group (38%). Some used the converse theorem: differentiability implies continuity, which is incorrect.

One student did not attempt the task on differentiability showing that the individual had no idea. He/she had no appropriate mental structures of the concept showing that the learner was at the pre- action level. 6 students (46%) showed some mix up of the concept of differentiability and continuity as shown in the following statements made by students:

f (x)= 1, f-(x) = -1, therefore not differentiable, f (x) not differentiable since lim x approach 0 = -0 and 0+, Lim |x|= 0

The findings show that these individuals did not have appropriate mental structures for the link between continuity and differentiability at process, object and schema level.

Conclusion

The research revealed that learners had difficulties with the notions of continuity, differentiability and their relationship. Most learners demonstrated a superficial knowledge of the concepts and there were not able to prove continuity of a function or its differentiability.

The concept of continuity on an infinite set would need the students to have the correct mental structures of the concept at both process and object stage. In this research learners were able to test continuity at the point (0,0) only and this might have been caused by the second question that required learners to check differentiability of the same function at point (0,0).

Students also demonstrated some difficulties with definitions of both concepts. The findings confirm that the students also have a weak background of the analytic definition of a limit. Other researchers have identified students' difficulties with limits. Corn (1991), Bezuidenhout (2001), Orton (1983) and these difficulties seem to influence the understanding of the concepts of differentiability and continuity

Learners' difficulties with the concepts also seem to be related to properties of real numbers such as inequalities that were needed in the task. The results also suggest that more work on sets, functions and their graphs should be covered at the beginning of an analysis course before considering the analytic definitions of concepts . A lot of work on limits, piece- wise continuous functions in tutorial tasks is needed in order to facilitate conceptual understanding of continuity and differentiability at process, object and schema level.

References

Asiala M, Brown A, De Vries, D, D,J, Dubinsky, E Mathews, D & Thomas, (1996). *A framework for research and development in undergraduate mathematics education.Research in collegiate mathematics education, 2, 1-32.*

Bezuidenhout J, (2001), *Limits and Continuity : Some misconceptions of first year university students. Intentional Journal of Mathematics Education in Science and technology.*

Cotrill J, Nchol ,D Schwingendorf K, Thomas K & Vidakovic D (1996), *Understanding the limit concept. journal of mathematical behaviour. 15(2) 167-192.*

Corn (1991) in Tall .O (1991), *Advanced mathematical Thinking,* Kluwer Academic , London. Publishers

Dubinsky E,& McDonald (2001), APOS: *A constructivist Theory of learning in Undergraduate mathematics Education research*. In Holton ed, *The teaching and learning of Mathematics at university level*.

Hahkioniemi M (2004), *Perceptual and symbolic representations as a starting point of the acquisition of the derivative. Proceedings of the 28th Conference of the International Group for the Psychology of mathematics Education. 3: 73 – 80.*

Heibert & Lefevre P. (1986), *Conceptual and Procedural Knowledge in Mathematics. An introduction Analysis* in D. Hiebert Ed. *Conceptual and procedural knowledge: The case for mathematics pp 1 – 27,* Hillsdale N.J. Eribaum.

Maharaj A. (2013), An *APOS analysis of natural sciences students' Understanding of the derivative*. *South Africa Journal of Education* (2013) 33(1).

Nickerson R.S. (1985) *Understanding Understanding, American Journal of Education* 93(2) 201 – 239.

Orton (1983) , *Students understanding of Differentiation. Educational studies in Mathematics*.

Piaget & Gracia R (1989) Psychogenesis and history of science. (H. Fieder,Trans) new York .Columbia university press.

Sawyer (1987), *Intuitive understanding of mathematical proofs, Bulletin of the I.M.A*., 23, 6.

Skemp R, (1971), *The psychology of learning mathematics, Hazel Watson & Viney ltd.*

Skemp R (1976), *Relational understanding and instrumental understanding. Mathematics teaching*. 77: 20 – 26.

Rudin. W. (1976), *Principles of Mathematical Analysis,* Mcgraw Hill.

Uygur & Ozdas A, *Misconceptions and difficulties with the chain rule. The mathematics education into the 21st century.*

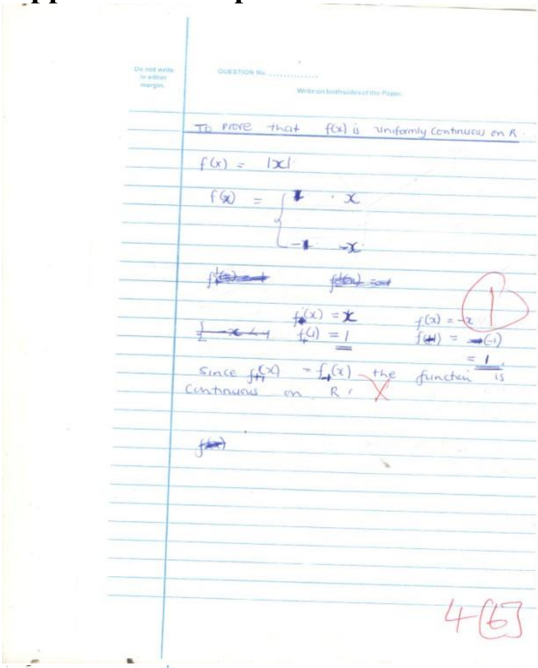
Vuma D. (1998), *Functions of a complex Variable*, University of Zimbabwe Publications

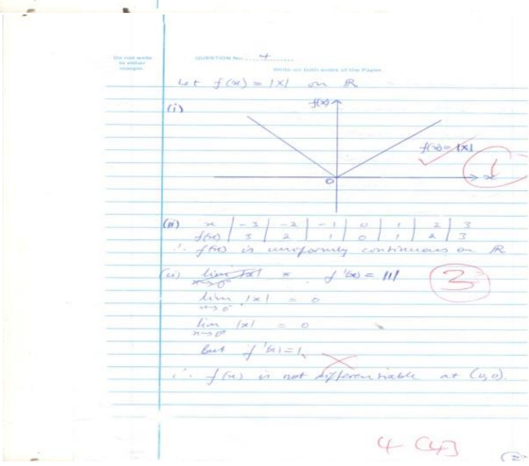
Weller K, Arnon I & Dubinsky E, (2009*(Pre service teachers' understanding of the relation between a fraction or integer and its decimal expansion. Canadian Journal of science, mathematics and technology, 9,5-28.*

Yin R. K. (2006), *Case study research Design and Methods, 3rd Edition*, Sage Publications, New Deli, India.

Zandieh M.J. *A theoretical framework for analyzing students understanding of the concept of the derivative. CBMS. Issues in mathematics education 8:103-122*

Appendices Sample of Students' Work





EDUCATION: NEW HORIZONS

Arun Datta
Technical University of Kenya - Nairobi
arundatta16@gmail.com

The way we think and our dispositions depend upon the make-up of our brains, which in turn depends to some extent, on the hormones that we inherit genetically. We reason and comprehend the world using a 'world-view', which is received from the community around us and is cultural. There is evidence that mathematical ideas were commonly used in parts of Africa. Mathematics represents an abstract thinking and reasoning. The ethno mathematics and the 'world-view' prevalent in Africa may not be the same as those of the West. Modern science and many other fields of study are based on the western thought. One is not consciously aware of one's own mental make-up and world-view. Are these significant enough to influence one's learning.

Key words: World-View, Ethno Mathematics, Testosterone and Education.

Background

Longman dictionary defines education as 'the process by which the mind develops through learning at a school, college or university'; i.e. learning facilitates the development of mind. The same dictionary defines development as 'to gradually change into an advanced state…' That means education involves changing the mind into an advanced stage. From the above we can infer that the mind is at a certain state before receiving education and further that education is associated with school, college and university.

For the purpose of this paper we take the brain as the seat of mind. Development of brain starts inside the womb. Research in the fields of chemistry, biology, neuroscience and psychology is throwing new light on this development. After birth the five senses start sending signals to the brain and it attempts to 'make sense' of them. What the brain comprehends of the world around, through the senses depends upon the 'world-view' it has received from the people around, at the early stage.

Scientists tell us that the development of different parts of the brain depend upon heredity i.e. parents, their parents and so on. The 'world-view' to understand the world, is received from the people around, at the infancy stage and is cultural. Until the stage of going to school, the child receives an informal education. It is in the school that the formal education starts.

Most of the branches of knowledge including science have been developed on the basis of western thought and world-view. These are the basis of formal education. If a child is born and brought up in a society whose world-view is different from the western, she has to undergo a transition. This paper visits the possibility of other ways of thinking and world-views and focuses on Africa.

Philosophy

Philosophies of mind, language and psychology bear on the foundations of our understanding, of how learning occurs and how teaching should promote it. This paper deals with the aspects of education dealing with the minds of learners, development, and the acquisition of knowledge and understanding.

Everything we do is a process of our past experiences shaping our intentions and choices. Philosophy gives attention to our thinking. Philosophy does not provide definitive answers. It can be frustrating. By asking questions, instead of answering them, it can help in examining and modifying the existing views. It sharpens the critical faculties.

Introduction

In this paper, three different research findings are explained, discussed and analyzed. It is considered that mathematics is the pure form of logic and reasoning. Professor Paulus Gerdes and others argue that mathematics was developed and used in day-to-day life in many parts of Africa. Although it did not take shape and expression as the 'western' one, it tells of a way of cognition and abstract thinking. The second research concerns the teaching of measurements to young Yoroba children in Nigeria. Professor Verran, the researcher argues that they have a different way of understanding and reasoning about the world. The children's received world-view contrasts with the western. Third research focuses on the development of human brain in relation to the presence of certain hormones that in turn are controlled by heredity. One's tendency to take interest in sciences or languages is decided before birth!

Mathematics

Ethno mathematics is a new research field, illustrated by studies of mathematical ideas in Africa. In their book *Code of the Quipu*, Ascher and Ascher write, "Mathematics arises out of, and is directly concerned with, the domain of thought involving the concept of numbers, spatial configuration and logic. In western culture a professional class, called mathematicians … deals solely and exclusively with these concepts." Other groups like accountants, engineers, and architects are also involved in mathematics, which is implicit. Ascher and Ascher argue that the professional mathematicians seek to maintain their exclusivity, in part " by recreating the past in terms of unilinear progress towards its own present." In 1986 Ascher defined ethno mathematics as "the study of mathematical ideas of non-literate peoples". It tries to study mathematics in its relationship to the whole of social and cultural life. According to Crump (1990), "it may be taken to refer to the system of knowledge and cognition typical of a given culture".

Professor Ron Eglash, of Rensselaer Polytechnic Institute, Troy, NY, was studying aerial photographs of traditional Tanzanian villages in 1988. He noticed that the thatched roofs of the huts were organized in geometrical patterns of circular clusters within circular clusters. Eglash recognized the patterns from his days as a Silicon Valley computer engineer. He digitized the images and fed to a computer. It was fractal geometry: the geometry of similar shapes repeated on ever-shrinking scales. A team of medical researchers has found that the clustering of pancreatic cells in the human body follows the same fractal rules as the meteorologists have used to describe cloud formation and the shape of snowflakes. Eglash writes "when Europeans first came to Africa, they considered the architecture much disorganized and thus primitive. It never occurred to them that the Africans might have been using a form of mathematics that they hadn't even discovered yet."

Paulus Gerdes the Mozambican professor of mathematics says " it seems necessary to reflect about other forms of mathematical activity in order to understand better, the relationships between nature, culture and the development of mathematical thinking". People living in the Northeastern Angola are known for their decorative art. This includes woven baskets, ceramics, engraving on calabash, paintings on walls and drawings in the sand called "sona". Each boy learnt "sona" during the initiating rites and it was used as illustration for story telling. After clearing and smoothing the ground, a set of equidistant points are created, which are then used to draw line figures. The experts developed a whole series of geometrical algorithms for the construction of different designs. In Lesotho and the neighboring parts of South Africa, women decorate the walls of their houses with designs. The walls are engraved with fingers, while the plaster is still wet. Symmetry is a basic feature. The women lay out a network of squares and then they reproduce the basic design in each squarer.

Gerdes was trained as a research mathematician in Europe. On his first contact with "sona", he 'felt' that he was dealing with mathematical ideas. He noticed that the mathematical community, all over the world, quickly absorbed the mathematical aspects of "sona". He concludes, "Mathematics is not a product of any particular culture sphere 'western', but a common human experience".

Measurements and Reasoning

Helen Verran, a teacher-trainer from Australia was supervising her students, preparing and conducting a class. The class consisted of over 50 Yoruba children in the South –West of Nigeria, with scanty teaching-resources.

According to the original teaching plan, height of a child was to be taken using a string and then the string was to be laid down on the floor and measured against a meter ruler. The trainee-teacher, a local, used a different technique of measurement. He made cards using hard cardboard of 10 centimeters by 5 centimeters. Length of the card was graduated in centimeters. The string which was the height of a child, was wound around the length of the cardboard and the remaining part measured from the graduation on it. For example if the length of the string were 95 centimeters, it would go along the length of the cardboard 9 times and 5 centimeters would be measured along the graduation.

Another lesson was for the measurement of lung capacity. The equipment consisted of a metal can, half filled with water and a plastic container that was filled with water and kept upside down in the can. One end of a rubber tube was inserted in the inverted container and a child would blow into the other end after taking a deep breath. Air bubbled into the plastic container, displacing water. Volume of the water displaced was the lung capacity of the child. Next step was to measure it. The plastic container was removed from the can, after placing a hand over its top and placed upright on the table. According to the original teaching plan, water from a measuring cylinder would be used to fill up the plastic container, giving the volume of water displaced by the breath. Instead, the teacher used a small jug. She counted how many jugfuls of water filled the container and then measured the volume of jug using the measuring cylinder. Thus the volume of water needed to fill the container was calculated.

According to Carnap (Philosophical Foundations of Physics, 52), a mathematically minded philosopher, numbers are an expression of a universal logic. He asserts that there is only one 'logic' and that we experience the physical world using numbers. Our senses present the world to the mind, as made up of things that have extensions. Objects in the world that we can know about, have certain qualities which can be quantified. Therefore numbers represent the real value of an entity through a given quality. For example the quality 'heaviness' of a given object can be represented by a number (its weight in kilograms). Numbers themselves have a sequence, expressing linear extension.

According to Carnap, the 'quality' of length exists in the world as a linear extension and not as made up of parts. Both the methods of measurement provide the same value for length although using different 'logics'. Similarly volume, a three dimensional quality, was not expressed as a linearly extending unified number, rather it was shown as made up of smaller 'volumes'.

The western view, expressed by Carnap, that the human mind comprehends the world 'only' as extension expressed by the linearly extending natural numbers is questioned. Therefore the assertion that there is only one type of 'natural' logic is also questioned.

The world-view provided by the culture, to the Nigerian child is that length is made up of parts. Modern scientific world-view, as explained by Carnap is that length is a quality, expressible by a series of increasing numbers. Carnap's view makes the basis of measurement, which in turn is the basis of science. Now, the Nigerian child has first to 'un-learn' the way she comprehends the world before learning modern science.

The process is rather subtle. The child does not know that she has a way of understanding the world. The only thing she experiences is that science as a subject of studies, is very complex, and may be ‘foreign.’

Testosterone

Simon Baron-Cohen has done research on the hormone testosterone, to understand its role on the development of mind and brain. It has been observed that on average girls develop empathy at a faster rate than boys. Empathy is the ability to understand other people’s feelings and problems. That means girls start taking interest in other people earlier than boys and that this interest grows faster with age. Boys on the other hand take interest in systems. For example how the mechanical toys, computers and phones work. Systems also include natural phenomena like weather and stars or mathematics. All these observations and trends are not showing that every male or every female is having that particular characteristic. When groups are compared, these differences show up.

A group of scientists with prof. Baron-Cohen have been looking for the possible causes for the sex differences. They have observed that males produce more of the hormone testosterone than do the females. Most of the research conducted, has been on animals and it shows a positive relationship between levels of testosterone and masculinity of the brain.

In the year 2000, a study was conducted in Cambridge, UK on the human newborns. In short, over a hundred, 24 hours old babies were presented with two objects, one after the other. One was a mechanical mobile and the other a human face. It was observed that, on the average, male babies looked longer at the mechanical object and the female babies at the human.

The study indicated that the males’ interest in systems and the females’ sense of empathy is inborn, biological and not acquired through culture or other influences. In other words, it is caused by something, which is in the brain, even before birth. Research on the animals showed that there is a sudden increase in the production of testosterone before birth. It was further shown that this production influences brain development. By manipulating the levels of testosterone in male and female rats, before and after birth, it was confirmed that it masculinizes the brain.

The next step for the researchers was to establish whether the same applies to humans. The aim was to somehow have some indication of the amount of testosterone in the human fetus and then to follow up with the same postnatally. Baby in the womb is surrounded by amniotic fluid. Sometimes, a small sample of this fluid is taken out with a needle, to test for any suspected abnormalities. With the consent of the mothers, the same fluid can be used to measure the testosterone levels. These are clear indicators of the testosterone levels of the fetus. After the birth of the babies, they are followed up, to study any relationship between their prenatal testosterone levels and their development as children and, may be, as adults. Experience has shown that children develop differently in terms of interests, personalities and pace.

The study was conducted on about 500 babies. It was found that the babies, who had high testosterone levels as fetus, made lesser eye contacts and had lesser vocabularies and most of these were males. Studies, when the babies were four years old showed that those with lower levels of fetal testosterone were more social and had more empathy. Those with high level of fetal testosterone were, on average, more interested in different types of systems. When they were eight years of age, MRI was done on their brains. One area of interest was the *planum temporale*, which is different in males and females. This area represents language skills. It was noted that the hormone testosterone’s prenatal levels influenced the growth, structure and development of the brain. The variation in the testosterone levels results from many different sources. One of them is genes.

Genes, Mathematics and Logic

Genes are got from the parents, their parents, their parents and so forth. And, genes affect the way our brains are structured, our interests and the way we think. To some extent, our interests, dispositions and capabilities are decided even before we are born. Although the research quoted, is at an early stage and the human brain has great potential for learning. But the research does indicate that one's interest in other people (and their welfare) is influenced genetically. Research in the area of ethno mathematics shows that different cultures in Africa understood nature and used the knowledge gained. Their reasoning and logic is systematic but different. Mathematics represents a metaphysical set of rules that are true in 'them' and happen to be applicable to nature. Now, what if, there is another 'mathematics' whose rules are also true and applicable to nature! People in Africa have not yet developed 'their' mathematics but that does not prove its non-existence. Verran brings it out rather clearly albeit she lays bare the different ways of comprehending nature and the world around. 'Western' mathematics provides a series of increasing (extending) numbers and western science 'sees' things in the world as 'extensions'. The Nigerians in her example 'see' the things in the world as 'made up' of smaller units, showing that 'their' mathematics (and reasoning) may be different.

Education

Science and technology have taken the world to new heights. All the communities of the world stand to gain by embracing, adopting, learning and contributing to it. It can be believed that the systematic study of nature that led to its modern state started in the west. The foundational world-view of modern science is understandably western.

Evidence is emerging that many African communities had and still hold different abstract cognitive abilities. Research is also showing that our mental capabilities and tendencies start taking shape even before birth and have a bearing on how our ancestors reasoned and 'saw' the world. The communities in which we grow up give world-view to us.

A child, born and brought up in a typical community, faces a new world-view as she enters school for 'education'. The child or even the teachers may not be conscious of the different views. The difference may lead to a lack of interest in subjects where the world-views contrast.

Conclusion - New Horizons

Humans are the most successful species on the earth. It is partly because they think and reason. They observe the surrounding, use their memory, reason and then act to the best of their advantage. It is this reasoning that leads to the correct way of doing anything including education. Learning is assimilating any new information, with what is already known, using reason.

The new horizons for education in Africa include finding out if the difference in the world-views is real. If it is, then ways should be found to fuse the two. To make the most of the education, one must be acquainted with its underlying view.

References

Ascher, Marcia and Ascher, Robert (1981) *Code of the Quipu: A Study in Media, Mathematics and Culture,* University of Michigan Press.

Ascher, Marcia and Ascher, Robert (1986) "Ethnomathematics", *History of Science*, 24:125-144.

Baron-Cohen, Simon (2013) "Testosterone on My Mind and in My Brain", *Thinking.* Edge Foundation, Inc. NY.

Baron-Cohen,Simon (2003) *The Essential Difference: Men, Women and the Extreme Male Brain.* Penguine Basic

Books, ISBN 978-0-7139-9651-5

Carnap, *Philosophical Foundations of Physics* (1966), publ. Basic Books Inc.

Crump (1990) *The Anthropology of Numbers*

Gerdes, Paulus (1986) ”How to Recognize Hidden Geometrical Thinking? A contribution to the development of anthropological mathematics”. *For the Learning of Mathematics*, 6(2): 10-12, 17.

Gerdes, Paulus (2000), *Culture and the Awakening of the Geometrical Thinking. Anthropological, Historical and Philosophical Considerations, An Ethnomathematical Study*. Minneapolis, MEP Press.

Verran, Helen(2001), *Science and an African Logic.* University of Chicago Press, Chicago.

WHAT'S THE PLACE OF COGNITIVE LINGUISTICS IN THE TEACHING OF ENGLISH IDIOMS IN KENYAN CLASSROOMS?

Moses Gatambuki
Karatina University
mgatambuki@yahoo.com

Gathigia Martin C. Njoroge
PanAfrica Christian University
mnjoroge@pacuniversity.ac.ke

Cognitive linguistics posits that metaphor is a ubiquitous feature of English idioms and a powerful educational tool for both second language teachers and learners. This paper, therefore, analyses 20 purposively sampled English idioms to illustrate how cognitive linguistics can be used to comprehend English idioms. To achieve this objective, the principles of the Conceptual Metaphor Theory (CMT), the dominant paradigm in Cognitive Linguistics, were employed. The study also adopted a survey research design because the focus was on analysing sampled English idioms. The data for this study were collected from the Macmillan English Dictionary (2007 edition), Oxford Advanced Learner's Dictionary (2010 edition) and the Internet. Content analysis, which is within thequalitative research paradigm, guided the analysis of the idioms. The study found that cognitive linguistics offers insightful ways on the teaching and learning of English idioms. This study recommends that for successful application of the CMT to idiom teaching and learning, teachers' metaphorical competence needs to be enhanced since they are the implementers of the curriculum. In addition, the study recommends that the study of English idioms move from theory to practice by sensitizing learners on the pervasiveness of metaphor in language and by encouraging them to extrapolate the conceptual metaphors underlying the English idioms in any given text. The study concludes that cognitive linguistics not only provides a framework within which idioms can be described but also facilitates the comprehension and retention of English idioms in the learning process.

Key Words: Cognitive linguistics, Metaphor, Conceptual Metaphor Theory, English Idiom

Introduction

Cognitive Linguistics (CL) is an approach to the study of language that looks at the nature of language, the mind and their relationship with socio-physical (embodied) experience (Evans, 2013)[1]. As a dynamic and attractive framework within theoretical and descriptive linguistics (Geeraerts, 2006), CL is one of the most reliable areas of research within the interdisciplinary project of cognitive science. Its reliability stems from the fact that CL aims at an integrated model of language and thought that reflects the human construal of external reality, taking into account the way in which human beings experience reality, both from cultural and psychological perspectives (Geeraerts, 2006). In CL, metaphor is regarded as one of the several kinds of *idealised cognitive model* (or ICM)[2]. As a process, metaphor involves combining language and thought to develop new non-literal meaning that enhances our reality

[1] CL emerged in the 1970's as a reaction against the dominant generative paradigms, and specifically the Generative Grammar and Montague Grammar, which were then dominant in the disciplines of linguistics and philosophy (Ruiz de Mendoza, 1997).

[2] According to Lakoff (1987, p. 68), ICMs are the way in which "human beings organize knowledge". Therefore, ICMs may be postulated as cognitive structures whose purpose is to represent reality from a certain perspective.

(Grant &Oswick, 1996)[3]. Since many idioms are motivated by metaphor, interpreting their actual meaning sometimes becomes difficult for learners[4].

Cognitive linguistics postulatesthat the meaning of idioms is motivated by conceptual mechanisms like metaphors, which implies that researchers should always bear in mind the relations between the conceptual system and the linguistic system (Csábi, 2002, pp.249-54)[5]. Metaphor, as a widespread feature of everyday thought and language (Goalty, 1997; Lakoff & Johnson, 1980), represents a central issue for both instructors and learners of English as a second language (Sacristán, 2004). This is particularly so in the teaching of English idioms. Strakšiene (2009), for example, notes this of idioms:

> Idioms are considered to be one of the hardest and most interesting parts of the English vocabulary. On the one hand, they are considered one of the most peculiar parts of the language; on the other hand, they are difficult because of their unpredictable meaning and grammar (p.13).

From the quotation above, idioms, thus, require special attention in language teaching as they have been identified to be a challenge to both teachers and learners of English (Boers, 2000a; Baker, 1992; Cooper, 1998). Cooper (1998), for example, notes that the difficulties connected with teaching idioms can be avoided if suitable methods that make the learners more aware of potential problems in using idiomatic language are used. Thus, the aim of this paper is to examine place of cognitive linguistics in the teaching of English idioms in Kenyan classrooms. This is because experimental evidence (Kövecses &Szabó, 1996; Boers, 2000a, 2000b) and theoretical contributions (cf. Boers, 1999; Boers &Demecheleer, 2004) have noted that cognitive linguistics can assist second language learners in comprehension and achievement of long-term retention in memory. How then can Kenyan language teachers make use of cognitive linguistics to aid the comprehension and retention of English idioms? In order to discuss this, this paper looks at English idioms and their organization into respective underlying conceptual metaphors.[6]

Theoretical Framework

The cognitive linguistics approach adopted in this paper is based on the insightfulness of the Conceptual Metaphor Theory (CMT). As proposed by Lakoff and Johnson (1980), the CMT suggests that human thought processes are largely metaphorical, and human conceptual system is structured and defined in a metaphorical way[7]. In other words, the CMT takes the basic assumptions of the Lakoffian School on "experiential realism", which hypothesizes

[3]An important thesis in Cognitive Linguistics is that metaphor is not just an aspect of language, but constitutes a primary part of human cognition (Gibbs, 1994; Lakoff, 1987; Lakoff& Johnson, 1980; Sweetser, 1990).

[4]Different definitions of idioms abound in literature. Simpson and Mendis (2003), for example, define an idiom as “a group of words that occur in a more or less fixed phrase whose overall meaning cannot be predicted by analyzing the meaning of its constituent parts” (p.423). Other definitions of idioms are propounded by Kövecses and Szabó (1996), Cooper (1998), Simpson and Mendis (2003, p.423) among other theorists in idioms studies.

[6]Researchers such as Lakoff and Johnson (1980), Kövecses and Szabó (1996) and Kövecses (1995) have systematized idioms based on their common concepts. Kövecses (1995), for example, found that the metaphorical understandings of anger “are in part based on shared ideas about the human body and certain physiological processes that are associated with anger” (p.191).

[7]The metaphorical expressions in our language are tied to metaphorical concepts in a systematic way, thus they would be used in a systematic way since the metaphorical concepts are structured systematically (Lakoff & Johnson, 1980).

thatthere is an intermediate level "cognition" between language and the world (Lakoff, 1987). In cognitive linguistics, metaphor is realised as the cross-domain mapping fromthe source domain ("vehicle") to the target domain ("tenor")[8]. According to Gibbs (1994), metaphor is not only a rhetorical device, but an important mental facility and cognitive instrument. Further, metaphors provide meaning to everyday experiences and are epistemological since they provide a frame from which we can view the world (Morgan, 2006). First, the relevance of the CMT (Conceptual Metaphor Theory) is that it enables people uncover the systematicity in many concepts that were believed to be unstructured (Soriano, 2003). Second, if the conceptual metaphor pervades the way we think, speak or act (Lakoff& Johnson, 1980), then, this study considers that it should also have some influence on the way we learn. This is because the CMT assumes that many motivated idioms are based on conceptual metaphors (Li, 2010). Similarly, Lakoff and Johnson (1980) posit that idioms are not arbitrary and accidental strings of words, but are totally rooted in human thought[9]. Thus, the CMT becomes a relevant framework of analysing English idioms as discussed below:

Methodology of the Study

This study adopted the qualitative methodological approach with a bias on the survey research design. Survey design was adopted because the focus was on analysing sampled English idioms. The data for this study were gathered manually from the Macmillan English Dictionary (2007 edition), Oxford Advanced Learner's Dictionary (2010 edition) and the Internet. The 20 idioms included in the study were purposively selected to meet the objective of the study. The English idioms collected are interpreted and explained to make sense of the data. Content analysis, which is within thequalitative research paradigm (Creswell, 2008), guided the analysis of the idioms. This is because English idioms that could be extrapolated into conceptual metaphors were selected. The conceptual metaphors are tabulated and their meanings discussed (cf. Table 1).

Findings and Discussion

From the analysis of the English idioms in our study, various conceptual metaphors were extrapolated based on the Conceptual Metaphor Theory. Table 1 highlights the English idioms, their meanings, sentential examples and their underlying conceptual metaphors:

Table 1: English Idioms and their Underlying Conceptual Metaphors[10]

No	Idiom	Meaning	Sentential example	Conceptual Metaphor
1	Hot under the collar	To be angry or embarrassed;	He got very *hot under the collar* when I asked him where he had been all day.	ANGER IS HEAT/FIRE
2	Fan the flames (of something)	To make a feeling such as anger, hatred, et cetra worse.	His writings *fanned the flames* of racism.	ANGER IS HEAT/FIRE
3	Explode (into/with something)	(Of a person or situation) to suddenly become very angry or dangerous.	Suddenly Charles *exploded with rage*.	ANGER IS FIRE/ANGER IS A (HOT) FLUID IN A CONTAINER

[8]Richards (1936, p.100) sees metaphor as the product of the interaction between the "tenor" and "vehicle". He posits: "The co-presence of the vehicle and tenor results in a meaning (to be clearly distinguished from the tenor) which is not attainable without their interaction" (p. 100). This approach into the nature of metaphors, which went beyond the Aristotelian perspective, revealed the cognitive aspects of metaphor and laid the foundation for later cognitive perspective of metaphors and conceptual metaphor theories.

[9]One of the central tenets of cognitive semantics is that a large proportion of figurative language is 'motivated' rather than arbitrary (Gibbs, 1994; Lakoff, 1987; Kövecses, 2002).

[10]From now on, this study will refer to the conceptual metaphor underlying the English idiom in capitalized terms to distinguish it from other word meanings.

4	Lose your cool	To become angry or excited	I try to be patient with her but she was so irritating in that meeting, I just *lost my cool*.	ANGER IS HEAT/FIRE
5	Add fuel to something	To make people argue angrily	That remark *added fuel to the fire*.	ANGER IS HEAT/FIRE
6	Blow a fuse/gasket	To become very angry	When he told her how much it cost, she *blew a fuse /gasket*.	ANGER IS HEAT/FIRE
7	Breathe fire over something	To be very angry	He was *breathing fire*.	ANGER IS HEAT/FIRE
8	Spit fire	To express one's anger or annoyance	He was spitting fire when he was told that his daughter was pregnant.	ANGER IS HEAT/FIRE BODY AS A CONTAINER
9	Make somebody's blood boil	To make somebody extremely angry.	WheneverIthinkofwhat he did to me, *it makes my bloodboil*.	ANGER IS A (HOT) FLUID IN A CONTAINER
10	Flip your lid	To become very angry and lose control of what you are saying or doing.	She *flipped her lid*.	ANGER IS A (HOT) FLUID IN A CONTAINER
11	Let (blow) off steam	To get rid of your energy, anger or strong emotions by doing something active or noisy	Joan's shouting did not mean she was angry with you; she was just *blowing off steam*.	ANGER IS A (HOT) FLUID IN A CONTAINER
12	Be/get (all) steamed up (about / over something)	To become very angry or excited about something that other people do not think is important.	Shegot *(all) steamed up* because he arrived over an hour late.	ANGER IS A (HOT) FLUID IN A CONTAINER
13	Hit the ceiling/roof	To suddenly become very angry	I am m afraid he *will hit the roof* when he finds out that our cheque has been canceled.	ANGER IS A (HOT) FLUID IN A CONTAINER
14	Blow your lid/top/stack	To get very angry	My father will *blow his top* when he sees what happened to the car.	ANGER IS A (HOT) FLUID IN A CONTAINER
15	Simmer down	To become calm after being excited or angry	Eventually, I could not*simmer down*.	ANGER IS A (HOT) FLUID IN A CONTAINER
16	Foam at the mouth	Someone who foams at the mouth is extremely angry about something.	The director was *foaming at the mouth* when he saw a picture of his children in the newspaper.	ANGER AS A (HOT) FLUID IN A CONTAINER
17	Spit venom/blood	To show that you are very angry/to speak in angry way.	I thought he was going to *spit venom/blood* when he saw what had happened.	ANGER AS A (HOT) FLUID IN A CONTAINER BODY IS A CONTAINER
18	Spill the beans	To tell somebody something that should be kept secret or private.	I *spilled the beans* and told Jackie I loved her.	MIND IS A CONTAINER and IDEAS ARE PHYSICAL ENTITIES
19	Caught/stuck between a rock and a hard place	In a situation where you have to choose between two things, both of which are unpleasant.	I am *stuck between a rock and a hardplace*; I do not know what to do.	DIFFICULTIES ARE IMPEDIMENTS TO MOTION
20	Come to fruition	The successful result of a plan, a process or an activity.	After months of hard work, our ideas have *come to fruition*.	IDEAS ARE PLANTS

Discussion of English Idioms into their Underlying Conceptual Metaphors

As noted in Table 1 above, various conceptual metaphors are identified. ANGER IS HEAT/FIRE, for example, is one of the conceptual metaphors underlying the English idioms below:

1. Hot under the collar.
2. Fan the flames (of something).
3. Explode (into / with something).
4. Lose your cool.
5. Add fuel to something.
6. Blow a fuse / gasket.
7. Breathe fire over something.

8. Spit fire.

The English idioms (1-8) above are all based on the basic physiological effect of anger, which is increased body heat (Lakoff& Johnson, 1980; Kovecses, 1986). Since human physiology is assumed to be universal (Wu, 2007), Lakoff and Kövecses (1987) posit that the metonymy PHYSIOLOGICAL EFFECTS OF ANGER STAND FOR THE EMOTION OF ANGER implying a universal form of physiological embodiment for anger, which would be the basis for the universality of the conceptual metaphor underlined by the above English idioms[11]. The existence of the English idioms (3) and (8), for example, is based on the fact that when a speaker expresses his/her anger, he/she unconsciously treats his/her body as a container full of anger ready to explode. English idiom (3) may also be said to activate the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER. Given such an interpretation, the above idioms are taken to be conceptual and secondarily a property of language (Kövecses, 2002). From a cognitive linguistics perspective, the fire / heat related idioms above can be used to describe the emotion “anger” correspondingly: Source concept: FIRE, Target concept: ANGER; the fire is anger; the thing burning is the angry person; the intensity of fire is the intensity of the anger; the duration of fire is the duration of being angry (Lakoff & Kövecses, 1987; Kövecses, 1990, 2000). In that perspective, the idioms are considered to be motivated rather than arbitrary.

The English idioms below underlie the ANGER IS A (HOT) FLUID IN A CONTAINER[12] metaphor:

1. Make somebody’s blood boil.
2. Flip your lid.
3. Let (blow) off steam.
4. Be/get (all) steamed up (about/over something).
5. Hit the ceiling / roof.
6. Blow your lid / top / stack
7. Simmer down.
8. Foam at the mouth.
9. Spit venom / blood.

The English idioms above, just like the ANGER IS HEAT/FIRE metaphors, are based on physiological experience (Lakoff, 1987; Kövecses, 1990).[13] That is, the concept of ANGER IS A (HOT) FLUID IN A CONTAINER is buttressed by a physiological explanation in terms of body heat and increasing internal pressure, based on shared ideas about the human body (Chen, 2010). The ANGER IS A (HOT) FLUID IN A CONTAINER.[14] According to Chen (2010), the metaphorical structure is not due to our conceptualization of ANGER as a hot fluid (as it is often assumed). Chen argues that the metaphorical pressure on the container walls, the potential swelling and the final explosion are motivated by a metaphorical increase in the amount of anger-fluid, not by the temperature of that fluid. Psycholinguistic research has shown that people’s tacit knowledge of conceptual metaphors, such as ANGER IS

[11]A detailed definition and explanation of “embodiment” and“embodied mind” in Cognitive Linguistics is found in Lakoff and Johnson’s *Philosophy in theFlesh* (1999).

[12]Since the HEAT aspect seems to be optional, we have preferred to use ANGER IS A (HOT) FLUID IN A CONTAINER, instead of ANGER IS A HOT FLUID IN A CONTAINER, or ANGER IS A HEATED FLUID IN A CONTAINER, as it had been called before. This is an idea borrowed from (Chen, 2010).

[13]ANGER IS HOT FLUID IN A CONTAINER is one of the very productive conceptual metaphors in different languages (Lakoff, 1987; Kövecses, 1990; Gibbs et al., 1997).

[14]According to Yu (1998), for the metaphor theme ANGER IS HEAT, English selects FIRE and FLUID metaphors. Yu notes that English describes the emotion of anger by referring to “its related physiological effects” (p. 59).

HEATED FLUID IN A CONTAINER, partly motivates how they make sense of idiomatic (Kövecses, 1990). In (17), for example, the English idiom below invokes the conceptual metaphor BODY IS A CONTAINER. Kövecses (1987, p.14) introduces the conceptual metaphor BODY IS A CONTAINER[15]. The justification for the BODY IS A CONTAINER metaphor is, first, the body is a container with a clear boundary that keeps it separates from other objects and people. Second, the body is situated in space and moves in it while maintaining varying distances to objects and people (Kövecses, 1987). ANGER IS A (HOT) FLUID IN A CONTAINER metaphor is responsible for our understanding of the anger experience as a process with different degrees of intensity. This helps us make sense of the expression of anger as a potentially dangerous and uncontrollable phenomenon (Kövecses, 1990, 2000).

In (a) below, the English idiom activates two conceptual metaphors at the same time, namely: MIND IS A CONTAINER and IDEAS ARE PHYSICAL ENTITIES MIND: (a) Spill the beans.

The two conceptual metaphors are caused by mental images corresponding to the idiom above. Idiom (a) evokes the image of an accidental or non-intentional action. According to Rosch (1978), the explanatory power of metaphorical models increases if the corresponding source domains are oriented towards the basic level of categorisation rather than formulated in abstract terms like CONTAINER or PHYSICAL ENTITIES. This does not contradict Lakoff's (1993) postulation that mappings from a source domain to a target domain "are at the superordinate level rather than the basic level" (p.212).

The English idiom below invokes the conceptual metaphor DIFFICULTIES ARE IMPEDIMENTS TO MOTION: (b) Caught/stuck between a rock and a hard place. The idiom is used to refer to somebody who is in a very difficult position or facing a hard decision. According to Spears (1997), however, the meaning is not sufficient because it neither involves the "images connected with the individual constituents nor the metaphor as a whole" (p.15). The metaphors "rock" and "hard place" evoke an image of something very solid, heavy, and immovable that hurts when one attempts to remove it. The underlying literal reading (that is, the source concept), on the other hand, is to be described as "lack of freedom of movement". Thus, according to Spears (1997), when this is mapped on the target concept "difficult position," idiom (b) appears as a realisation of the conceptual metaphor DIFFICULTIES ARE IMPEDIMENTS TO MOTION.

In (c), the idiom invokes the IDEAS ARE PLANTS conceptual metaphor: (c) Ideas have come to fruition.

Lakoff and Johnson (1980) introduced the conceptual metaphor IDEAS ARE PLANTS. The two authors note that it is natural for people to find similarities between plants and themselves. Thus, the logic behind the idiom above is because plants give rise to fruits. When applying the IDEAS ARE PLANTS conceptual metaphor, the features of plants and seeds are used to describe ideas and other abstract notions such as imagination and thoughts (Lakoff& Johnson, 1980 p. 47). That is, the subcategories or stages of the plant metaphor: *seed, sprouting, budding, flowering, fruition* and *withering* may also be mapped onto the target concept of idea.

Recommendations

This study proposes several recommendations. First, teachers of English in Kenya and beyond should makelearners aware of the ubiquity and significance of metaphors in their daily life. Teachers can do so by letting the learners understand that the philosophical basis of

---

[15] Pauwel& Simon-Vandenbergen (1995) argue that there are more basic concepts on which these body metaphors are grounded, such as container, movement, and force.

cognitive study of metaphor is experientialism, which characterizes meaning in terms of embodiment. This is because research has shown that organised categorisation of phenomena promotes ‘in-depth’ cognitive processing, which enhances memory storage (Boers, 2001, p.36). In addition, teachers should encourage students to extrapolate the underlying conceptual metaphors from idiomatic expressions. This is because raising learners’ awareness of the metaphoric nature of idioms has a beneficial effect on vocabulary retention (Boers, 2000a, 2000b).

Second, this paper recommends that if the Conceptual Metaphor Theory is to be applied to the teaching and learningof idioms in Kenya, teachers’ metaphorical competence should be improved since they are the implementers of the curriculum. Their metaphorical competence will not only deepen the understanding of knowledge about English idioms, but will enhance their communicative competence. Therefore, the Kenyan government, language teacher educators and the Kenya Institute of Curriculum Development (KICD) should make every effort to provide opportunities for teachers to further their study of the Conceptual Metaphor Theory. This will help in laying a solid foundation for the cognitive linguistics framework in the teaching of idioms thereby bringing theory and practice closer together. This will provide a meaningful context for the acquisition of English idioms by Kenyan learners through focusing on conceptual metaphors as well as on the various metaphoric relations that exist between idioms.

Further, dictionary makers, linguists and other stakeholders in language education in Kenya should expose the cognitive function of idioms to the learners of English as a second language by providing definitions, meanings and examples that are practical and easy for learners to remember. This is because the cognitivist view postulates that the meaning of many idioms is not arbitrary, but it is motivated by metaphor, metonymy and conventional knowledge (Kövecses, 2002). Thus, the aforementioned should, through their awareness campaigns of the cognitive linguistics, help learners and ESL practitioners realize the importance of the CL framework in helping learners recognize the systematicity between concepts (Kömür & Çimen, 2009).

Conclusions

On the basis of the findings presented above, first, this paper concludes that cognitive linguistics not only provides a framework within which idioms can be described but can alsoserve pedagogical purposes in the teaching of English idioms in Kenyan schools. This is because cognitive linguisticsincreases students' motivation for studying idioms on the basis of the insights of the Cognitive Metaphor Theory. Second, this paper concludes that the CMT method is an effective complement in idiom teaching and learning since the idioms used for discussion in this paper are ‘motivated’ rather than ‘arbitrary’. That is, the English idioms discussed in this paper, are motivated conceptually by general knowledge of the world, which is embodied in the conceptual system.

References

Baker, M. (1992). *In other words: A course book on translation*. London and New York: Routledge.

Boers, F. (1999). When a bodily source domain becomes prominent: The joy of counting metaphor in the socio-economic domain. In R. W. Gibbs and G. J. Steen (Eds.), *Metaphor in cognitive linguistics* (pp. 47-56). Amsterdam and Philadelphia: John Benjamins.

Boers, F. (2000a). Enhancing metaphoric awareness in specialised reading. *English for Specific Purposes, 19,* 137-147.

Boers, F. (2000b). Metaphor awareness and vocabulary retention. *Applied Linguistic, 21,* 553-571.

Boers, F. (2001). Remembering figurative idioms by hypothesizing about their origin. *Prospect, 16* (3), 35-43.

Boers, F., &Demecheleer, M. (2004). Cross-cultural variation as a variable in comprehending and remembering figurative idioms. *European Journal of English Studies, 8,* 375-388.

Chen, P. (2010). A Cognitive study of “Anger” metaphors in English and Chinese idioms. *Asian Social Science, 6*(8), 73-76.

Cooper, C. (1998). Teaching idioms. *Foreign Language Annals*, *31*(2), 255 – 266.
Creswell, J. W. (2008).*Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, N.J: SAGE Publications.
Csábi, S.(2002). Polysemous words, idioms and conceptual metaphors: Cognitive linguistics and lexicography. *Proceedings of the tenth Euralex international congress*(pp.249–254). Copenhagen: Center for Sprogteknologi.
Evans, V. (2013). *Language and time: A cognitive linguistics approach*. Cambridge: Cambridge University Press.
Geeraerts, D. (Ed.). (2006). *Cognitive linguistics: Basic readings*. Berlin: Mouton de Gruyter.
Gibbs, R. (1994).*The poetics of mind: Figurative thought, language, and understanding*. New York: Cambridge University Press.
Gibbs, R.W., Bogdanovich, J.M., Sykes, J.R., & Barr, D.J. (1997). Metaphor in idiom comprehension. *Journal of Memory and Language*, *37***,** 141–154.
Goatly, A. (1997). *The language of metaphors.* London: Routledge.
Grant, D., &Oswick, C. (Eds.). (1996). *Metaphor and organizations*. London: Sage.
Hornby, A., & Turnbull, J. (Eds.). (2010). *Oxford advanced learner's dictionary of current English* (8th ed.). Oxford: Oxford University Press.
Kömür, Ş., & Çimen, Ş.S. (2009). Using conceptual metaphors in teaching idioms in a foreign languagecontext. *SosyalBilimlerEnstitüsüDergisi (İLKE), 23,* 205-221.
Kövecses, Z. (1986). *Metaphors of anger, pride and love: A lexical approach tothe structure of concepts.* Amsterdam &Philadelphia: John Benjamins.
Kövecses, Z. (1990). *Emotion concepts.* Berlin and New York: Springer-Verlag.
Kövecses, Z. (1995). Anger: Its language, conceptualization, and physiology in thelight of cross-cultural evidence. In J. R. Taylor & R. MacLaury (Eds.),*Language andthe cognitive construal of the World* (pp.181-196). Berlin: Mouton.
Kövecses, Z. (2000). *Metaphor and emotion*. Cambridge and New York: Cambridge University Press.
Kövecses, Z. (2002). *Metaphor: A practical introduction*. Oxford: Oxford University Press.
Kövecses, Z., &Szabó, P**. (**1996). Idioms: A view from cognitive semantics. *Applied Linguistics*, *17* (3), 326-355.
Lakoff, G. (1987). *Women, fire and dangerous things*. Chicago: The University of Chicago Press.
Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (pp. 202-251). Cambridge: Cambridge University Press.
Lakoff, G., &Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago Press.
Lakoff, G., &Johnson, M. (1999).*Philosophy in the flesh: The embodied mind and its challenge to western thought.* New York: Basic Books.
Lakoff, G., & Kövecses, Z.(1987). The cognitive model of anger inherent in American English. In Holland, D., & N. Quinn (Eds.),*Cultural models in language and thought*(pp.195-221).New York and Cambridge: Cambridge University Press.
Li, X. (2010). Conceptual metaphor theory and teaching of English and Chinese idioms. *Journal of Language Teaching and Research*, *1* (3), 206-210.
Morgan, G. (2006). *Images of organizations*. Thousand Oaks, CA: Sage.
Pauwels, P., &Simon-Vandenbergen, A. (1995). Body parts in linguistic action: underlying schemata and value judgements. In L .Goossens, P. /Rudzka-Ostyn, B. Simon-Vandenbergen, J. Vanparys(Eds.), *By word of mouth: metaphor, metonymy and linguistic action in cognitiveperspective* (pp.35-69), Amsterdam/Philadelphia.
Richards, I.A. (1936). *The philosophy of rhetoric*. Oxford, Oxford University Press.
Rosch, E. (1978). Principles of categorization. In E. Rosch. & B. Lloyd (Eds.), *Cognition and categorization* (pp.27-48).Hillsdale, NJ: Lawrence Erlbaum.
Ruiz de Mendoza, I. F. (1997).Cognitive and pragmatic aspects of metonymy. *Cuadernos de FilologíaInglesa*, *6*/2, 161-178.
Rundell, M., & Fox, G. (2007). *Macmillan English dictionary for advanced learners*. London: Macmillan.
Sacristán, M. (2004). Metaphor and ESP: Metaphor as a useful device for teaching L2 Business English Learners. *Iberica*, *10*, 115–131.
Simpson, R., &Mendis, D.(2003). A corpus based study of idioms in academic speech. *Tesol Quarterly*, *37*(3), 419–441.
Soriano, C. (2003). Some anger metaphors in Spanish and English: A contrastive review. *International Journal of English Studies*, *3* (2), 107-122.
Spears, R.A. (1997). *NTC's thematic dictionary of American idioms.* Lincolnwood:NTC Publishing Group.
Strakšiene, M. (2009). Analysis of idiom translation strategies from English into Lithuanian. *Studies about Languages*, *14*, 13-19.

Sweetser, E. (1990). *From etymology to pragmatics: Themind-as-body metaphor in semantic structure andsemantic change.* Cambridge, England: CambridgeChicago: Chicago University Press.

Wu, S.G. (2007).*A corpus-based synchronic comparison and diachronic interpretation of lexicalized emotion metaphors in English and Chinese* (Unpublished doctorate thesis), Lingnan University, China.

Yu, N. (1998). *The Contemporary theory of metaphor*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

RELATING THEORY AND PRACTICE IN THE TEACHING OF CONNECTORS

Moses Gatambuki Gathigia
Karatina University
mgatambuki@yahoo.com

Martin C. Njoroge
PanAfrica Christian University
mnjoroge@pacuniversity.ac.ke

Coherence and cohesion are essential elements that a well-constructed written sentence or text should consist of. Connectors are usually used to indicate coherence and cohesion between units of a discourse. A sample of academic writing with connectors present is perceived to be more logical, convincing and authoritative than the same sample with all the connectors removed. Learners of English as a second language tend to misuse connectors in their writing creating comprehensive problems that may be so impenetrable as to defy normal decoding of a text. With this background information, this paper examines the teaching of connectors using the conventional approach and the essay-based approach, which is also complemented by the Coherence and Relevance theoretical framework. The study is conducted using a pretest / posttest paradigm to test the efficacy of the two approaches of teaching connectors. Two Form three classes were sampled for this study. A pretest on logical connectors was administered in each school, marked and results recorded. The experimental class was exposed to the teaching of connectors using the essay - based approach (textual) method as a tool of teaching while the control class was exposed to the conventional approach of teaching. A posttest, the same test administered as a pretest, was given to the two groups. The scores recorded in both tests were analyzed quantitatively using the Levene's Test for Equality of Variances. The analysis is then presented in tables, graphs and findings discussed. In addition, the paper proposes recommendations for pedagogy.

Key words: Coherence, Cohesion, Connectors, Pretest, Posttest

Introduction

Connectors are linking devices that connect segments of discourse in order to develop logic and cohesion (Celce-Murcia & Larsen-Freeman, 1999). The teaching and learning of connectors has always been a challenge to linguists and researchers (Crewe, Wright & Leung, 1985). Consequently, as a way of trying to understand the mechanism in which connectors work, various terms have been used to describe them in English. Linking devices are referred to as, ‘connective adjuncts’ (Huddleston & Pullum, 2002, p.775), ‘connectives’ or ‘conjuncts’ (Finch, 2000, p.91), ‘linking adjuncts’ (Carter & McCarthy, 2006, p.539), ‘logical connectors’ (Celce-Murcia & Larsen-Freeman 1999, p.519), ‘conjunctive adverbials’ (Bussmann, 1996, p. 95), ‘connective adverbs’ (Huddleston & Pullum, 2002, p.1319), and ‘linking adverbials’ (Biber et al., 1999, p.875). For the purposes of discussion in this paper and to avoid creating confusion by using different terms, this paper will henceforth use the term connectors.

Cohesion, a concept created by connectors, is a factor that determines whether a group of sentences form a unified text or they are simply a collection of unrelated sentences (Halliday & Hasan, 1976). Generally, connectors function as cohesive “signposts” in discourse that help guide the reader or listener through the message by signalling how successive units are related (Leech & Svartvik, 1994, p. 177). The importance of connectors in a text cannot be ignored. Castro (2004), for example, notes that students use connectors to connect ideas together. He adds that lack of cohesion in students’ essays is brought about by misuse of content lexical ties as well as inappropriate logical connectors that cause major breakdown in the comprehension of the written texts.

A cursory examination of Secondary school English textbooks in Kenya, show that they do not put a lot of emphasis on the teaching of connectors. Although Tella et al. (2010) found that students have generally positive perspective towards the secondary school English curriculum in Kenya, the authors of this paper feel that there is a disconnect in the requirements of the syllabus and the teaching of connectors. Novel and learner-centered methodologies should be devised as a way of helping students achieve cohesion and eliminate misuse of connectors in their writing. Misuse of connectors leads to a potential communicative breakdown and make writing appear "dense, opaque, or even incoherent to the reader" (Hartnett, 1986, p. 146). This paper, therefore, looks at the effectiveness of the conventional approach and the essay based approach of teaching English connectors in Kenyan Secondary schools.

Statement of the Issue

Knowing a language means to be able to produce coherent verbal and written sentences to convey one's message to the addressee. However, several studies in English as a second language have reported that learners have particular difficulty handling connectors (Crewe, 1990; Bolton et al., 2002; Field & Yip 1992; Demirci & Kleiner, 1997). This may be a pointer that the conventional methods of teaching connectors are somewhat misplaced leading to misuse of logical connectors. Such misuse of connectors may arise in students' writing because as Zamel (1984, p. 111) notes: 'what they have been offered, if composition texts are any reflection of teaching strategies, are lists of cohesive devices categorized according to function.' This paper, therefore, intends to compare the efficacy of the conventional approach and the essay-based approach so that alternative teaching approach can be recommended.

Rationale

Our choice of English as a subject of study is based on several reasons. First, Cook (2007, p.25) notes that English is a very important language in the whole world, as it "is now taught as the main foreign language in virtually every country, and is used for business and education." In addition, English has become the "lingua franca" of the modern world, and as such, research into coherence and cohesion strategies in English discourse is considered relevant to all spheres of human communication (Crewe, 1990). Similarly, Crystal (2002) argues that if the aim of English teaching is to produce students who are able to encounter the English speaking world with confidence then you cannot avoid bringing global English into the classroom.

Second, our study of connectors is based on the fact that they are important in terms of how a text is perceived. The use of connectors has been identified as a problem both for foreign language learners as well as native speakers (Crewe, 1990; Field & Yip, 1992). Crewe (1990) and Hartnett (1986), for example, note that when a good writer uses connectors judiciously, they enhance the communicability of the text and when used badly, they simply create comprehensive problems. In the same vein, Mauranen (1993) argues that academic writing with connectors present is perceived to be logical and convincing than the same sample with all the connectors removed, hence the need to investigate the use of connectors in the writing of Kenyan learners.

Third, the findings discussed in this paper will form the basis for pedagogical implications. The findings will serve as useful information for planning the teaching of connectors, the writing of lesson plans and syllabuses and improving the teaching of writing to learners of English as a second language. In view of the above, it is hoped that the findings of this study would add new information to fill gaps in the existing body of knowledge regarding cohesion and coherence in learners' writing, especially in English as a second language contexts.

Literature Review

The Notions of Cohesion and Coherence

This paper provides a general overview of the various views regarding the notions of cohesion and coherence, two essential elements that facilitate textual continuity in writing. Halliday and Hasan (1976), for example, note that “cohesion does not concern what a text means; it concerns how the text is constructed as a semantic edifice” (p.26). They add that coherence is what makes the text semantically well formed. In the same vein, Kolln (1999, p. 94) postulate that while cohesion mainly involves the semantic relations between sentences, coherence can be defined as “cohesion on a global scale.”That is, coherence primarily concerns the overall connectedness of the ideas in a piece of writing rather than (inter) relationships between sentences. Enkvist (1990) also notes that cohesion refers to the overt semantic relations in the text, whereas coherence refers to semantic and pragmatic relations between text parts that are interpretable against the background of specific world knowledge. However, according to Hoey (1991) and Hellman (1995), a text can be coherent without formal cohesive devices.

Studies on Connectors

Connectors in various languages have extensively been studied. Yankova (2005), for example, compares grammatical and lexical cohesive devices as they appear in Bulgarian and British statutory texts. In French, Granger and Tyson (1996) find clear evidence of overuse and underuse of individual connectives in their study of adverbial connectives in student essays. They also find evidence of semantic, stylistic and syntactic misuse of connectives. Wikborg and Björk (1989) establish that in Swedish students’ expository essays, both Swedish and English, one of the most common reasons for coherence breaks in the texts was underuse and/or misuse of connectives. Neuner (1987, p.101) investigates the use of cohesive devices in ‘good’ and ‘poor’ freshman essays at a US college and highlights the ways in which cohesion in essay writing is achieved through a variety of cohesive devices, including ‘chains’ of reference, conjunctions, and lexical ties.

In another study, Crewe’s (1990, p. 324) finds out that Hong Kong students’ overuse of connectors may be motivated by their ‘trying to impose surface logicality on a piece of writing where no deep logicality exists’ but that the result is typically a ‘clutter’ that ‘makes the argument extremely tortuous.’ Among other findings, Crewe (1990) noted that the reinforcing connector *moreover* was also overused by the learners and identified eight most underused connectors were *however*, *instead*, *though*, *yet*, *hence*, *therefore*, *thus*, and *then*. Logical connector use is also challenge for Japanese EFL learners. The findings in the reviewed literature motivated the conducting of the research reported in this paper as we wished to find out whether the same challenges are encountered among Kenyan learners of English as a second language.

Theoretical Framework

This study employs the Coherence and Relevance theories. According to Khajehei and Shakarami (2012), the two approaches are pragmatic in essence and do not explain the text just in terms of linguistic factors. The Coherence and Relevance theories also look at relations created by the units in a text. The Coherence Theory, on the one hand, is concerned with the formal relations between major parts of the text. Kolln (1999, p. 94) postulates that while cohesion mainly involves the semantic relations between sentences, coherence can be defined as “cohesion on a global scale.” Similarly, Crewe (1990) argues that cohesion helps the text to be more comprehensible and, therefore, reader-friendlier by forming a unified whole rather than a collection of unrelated sentences. Thornbury (2005) succinctly argues that cohesion ‘hangs the text together’ (2005, p. 19). Thus, the overall coherence of a longer text depends on the coherence within each paragraph or section of the text (Celce-Murcia & Olshtain, 2000).

The Relevance Theory, on the other hand, sees coherence and cohesion merely as superficial symptoms of something deeper, that is, relevance relations (Blass, 1990). While coherence is the relation between linguistic units such as utterances, relevance is a relation defined not only for utterances but also for assumptions, that is, units of information and thoughts (Blass, 1990). The Relevance theory argues that instead of taking the notion of coherence as the main holder of textual relation, what is needed for comprehension is relevance relation in terms of contextual effects. This paper is of the opinion that the two theories are complementary and should be employed in the analysis and teaching of connectors.

Research Methodology

Research Design

This study adopts both qualitative and quantitative research designs. On the one hand, a qualitative research "say[s] how things are' by informing the reader of phenomena as experienced by the study participants and interpreted by the researcher in a relevant context" (Creswell, 2007; Merriam, 1998). On the other hand, a quantitative research provides statistics to the researcher necessary for logical inferences (Kothari, 2004; Creswell, 2007). Since this study was designed to investigate the efficacy of the essay-based approach and the conventional method towards the teaching of connectors, a pretest / posttest paradigm was also conducted.

Study Locale, Population and Sample Size

One secondary school in Nyeri County, Kenya, was purposively sampled for this study. To achieve the objective of the study, data were collected from Form three students studying English as a second language. The researchers visited the school for permission from the Principal to undertake the research. The two Form 3 classes were coded as A and B respectively. The two Form 3 classes had a research sample of 25 learners each and had similar English proficiency.

The Experimental Cohort

25 students were in the experimental cohort. The experimental cohort (code A) was exposed to the essay-based approach towards the teaching of connectors. The learners were introduced to the four major categories of connectors as identified by Halliday and Hassan (1976). The teacher explained by using an essay (cf. Appendix C) how different connectors of different functions can be used in a text in order to create coherence, cohesion and relevance. The students were expected to use the different types of connectors in coming up with a creative and logical essay. The essential features of a well-written text, the unity and connectedness, which make the individual sentences in the text "hang" together and relate to one another (Celce-Murcia & Olshtain, 2000) were supposed to be obeyed. After the learners had written the essays, the researchers marked and identified the areas of misuse. Misuse of logical connectors evident in the poor choice of connectors of adversatives, and in some cases where additives were used to underline contrast was corrected. That is, the teacher developed awareness of misuse of connectors through explicit instruction, teacher feedback and essay revision.

The Control Cohort

25 students were in the control cohort. The control (code B) was exposed to the conventional approach towards the teaching of connectors. The learners were introduced to the four major categories of connectors as identified by Halliday and Hassan (1976). The teacher introduced the connectors to the learners, listed the connectors as classified according to function and gave an exercise for students to fill in the blank spaces with the correct connector. The teacher marked the exercise and indicated on the exercise books the expected answers for the incorrect responses.

Data Collection Procedures

Since the aim of this research was to test the efficacy of using essay-based approach in the teaching of connectors in English, the tests were developed based on the revised English syllabus (Kenya Institute of Education, 2002). The tests took into cognizance the Halliday and Hasan's (1976) classification of cohesive devices in terms of *additive, adversative, causal* and *temporal* categories. Therefore, five items from each category were tested making the pretest contain twenty questions. A pretest administered by the two researchers was administered to the two Form three classes during the first day, marked and results recorded. The pre-tests were marked and the scores recorded. On the second day, the experimental group, that is class A, was exposed to connectors using the essay-based approach as a teaching method for a period of 40 minutes. The control group, that is class B, was exposed to the use of the essay-based approach as a method of teaching connectors in English. On the third day, a posttest was administered to both class A and class B. The posttest was the same test administered as the pretest. The researchers scored the pre-tests and posttests and generated quantitative data for analysis.

Data Analysis

Data analysis is the process of providing order, structure, and interpretation to collected data (Marshall & Rossman, 1999). With this in mind, quantitative data elicited from the learners' performances in the pretest and posttest was analyzed using the Statistical Package for Social Sciences (SPSS). Specifically, the Levene's Test for Equality of Variances was used to identify whether the observed differences between two sample means were purely random or whether there were real differences between the means. That is, the researchers wished to see whether variability in the dependent linguistic variables was statistically significant so that it could be concluded that the means were different. The results were then presented in tables showing means and standard deviations and levels of statistical significance.

Research Findings

Figure 1 below presents the results of data analysis and the interpretation and the discussion of the emerging patterns is based on these results.

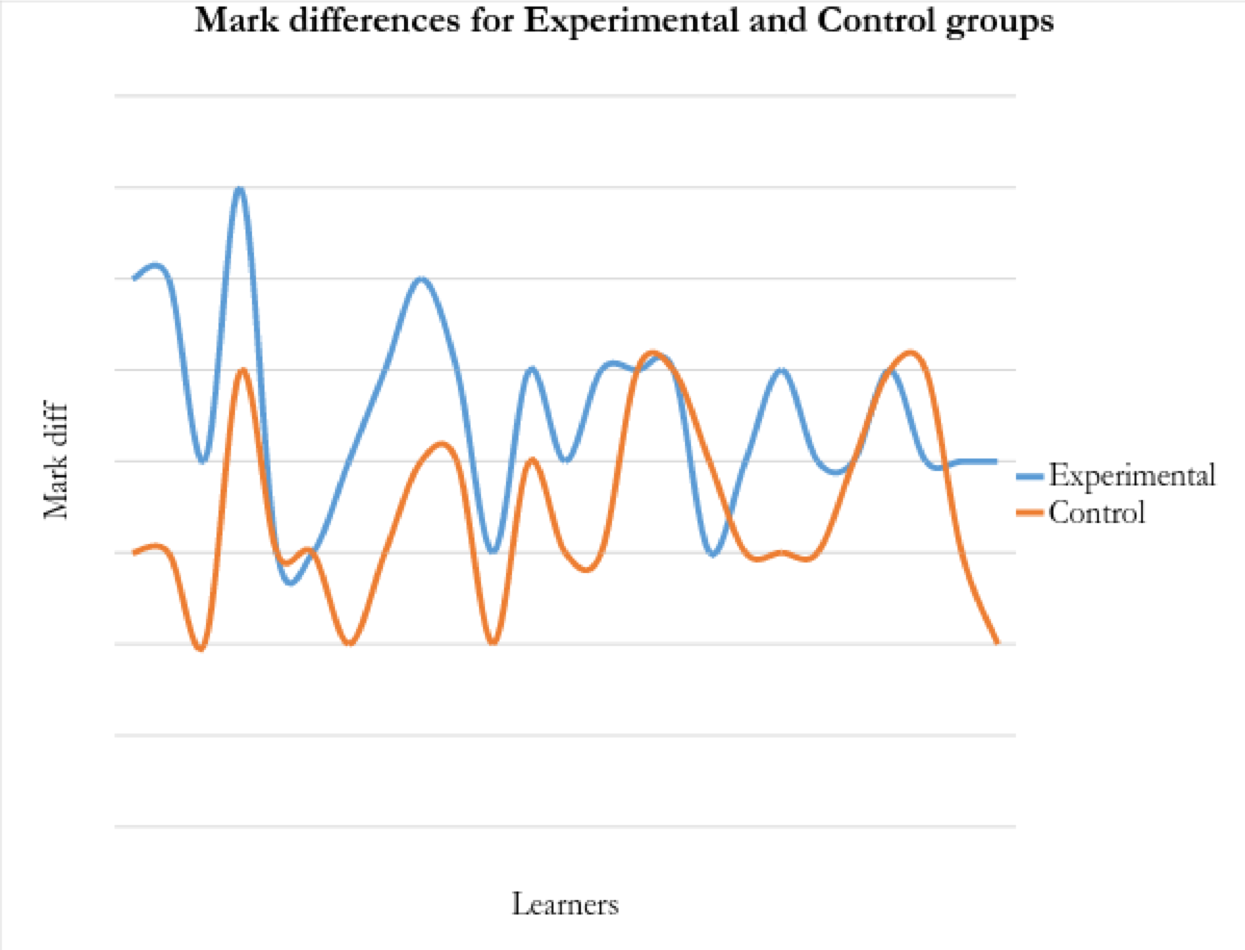


Figure 1: Test Differences Between the Experimental and the Control Groups.

Figure 1 above indicates that generally, the difference between the pretest and posttest among the experimental group is higher than that of the control group. This is also confirmed in the descriptive statistics below which shows that the average difference is higher in experimental group than the control group; hence, the learners responded positively to the test.

Table 1: Descriptive statistics of the experimental and control groups

Descriptive Statistics

Group		N	Minimum	Maximum	Mean	Std. Deviation
Experimental	Pretest	25	9.00	16.00	12.3600	1.95533
	Posttest	25	13.00	20.00	16.8800	1.92180
	Diff	25	3.00	7.00	4.5200	1.04563
	Valid N (list-wise)	25				
Control	Pretest	25	10.00	16.00	12.5200	1.66132
	Posttest	25	14.00	19.00	16.0000	1.47196
	Diff	25	2.00	5.00	3.4400	1.00333
	Valid N (list-wise)	25				

The results of the independent t-test as well confirm that the mean of the experimental group is higher than that of the control group, which clearly shows the positive effect of the essay-based approach (textual) method on the retention of English connectors (cf. Tables 1 & 2). That is, the results obtained reveal a significant difference between the two groups, implying that the experimental group significantly outperformed the control group with regard to the performance of English connectors.

Table 2: T test and group statistics

Group Statistics

	tt	N	Mean	Std. Deviation	Std. Error Mean
Diff	Experimental	25	4.5200	1.04563	.20913
	Control	25	3.4400	1.00333	.20067

Table 3: Differences between pre-test and post-test scores

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Diff	Equal variances assumed	.007	.933	3.726	48	.001	1.08000	.28983	.49726	1.66274
	Equal variances not assumed			3.726	47.918	.001	1.08000	.28983	.49724	1.66276

In Table 3 above, the Levene's Test for equality of variances column has sig value of 0.933, which is higher than the p value of 0.05; hence, we conclude that there is no statistically significant difference between the two variances. On the other hand, on the Equality of means, we get sig (2-tailed) of 0.001 which is lower than the p value = 0.05 at 95% confidence level; hence, we conclude that there is a statistically significant difference between the means therefore confirming our earlier observation. Therefore, the results reveal that the essay-based approach (textual) method is significantly more effective than learning English connectors using the conventional method. It can be concluded that the essay-based approach (textual) method helped the learners to figure out the meaning of the English connectors.

Implications of the Study

This study has implications for teaching and learning processes. First, the findings of the study indicate that the essay-based approach can help learners understand and retain English connectors they are exposed to. This is because instruction should be based on putting connectors into a context because the learners' ability of comprehending new words in general increases when being used in a meaningful context (Kolln, 1999). Second, the findings could, therefore, persuade teachers of English in Kenya on the importance of using the essay-based approach in the teaching of English connectors. Based on the findings of this paper, we suggest that teachers of English use this technique in their classes and encourage learners to use this technique rather than asking them to memorize the connectors in a rote fashion. Third, the Kenya Institute of Curriculum Development (KICD) and other stakeholders in language learning and teaching should frequently induct teachers on the essay-based approach to the teaching of English connectors. Moreover, the KICD should give the essay-based approach to the teaching of English connectors a more prominent role in second language learning.

Conclusions

The findings of this paper have shown that the class that used the essay based approach as a method of learning English connectors performed better in the posttest than the control class which points to the need for the teachers of languages to apply this approach in their teaching instead of the conventional approach that is commonly used in the language classroom. Thus, the study concludes that the essay-based approach is an effective strategy of teaching English connectors. This is made possible by relating theory and practice in the teaching of connectors. Teachers of languages should, therefore, utilize the essay-based approach to create a learning atmosphere that is conducive for the learners. This will in turn help in the improvement of learners' performance in English connectors.

References

Biber, D., Johansson, S., Leech, G., Conrad, S., & Finegan, E. (1999). *The Longman grammar of spoken and written English*. London: Longman.

Blass, R. (1990). *Relevance relations in discourse.* Cambridge: Cambridge University Press.

Bolton, K., Nelson, G., & Hung, J. (2002). Corpus-based study of connectors in student writing *International Journal of Corpus Linguistics, 7* (2), 165-182.

Bussmann, H. (1996), *Routledge dictionary of language and linguistics,* London: Routledge.

Carter, R., & McCarthy M. (2006). *Cambridge grammar of English: A comprehensive guide to spoken and written grammar and usage.* Cambridge: Cambridge University Press.

Castro, C. (2004). Lexical cohesion and chain interaction: How L1 Arabic, Japanese and Spanish writers construct meaning in L2 English. *Journal Bahasa Jendela Alam Jilid, 3*, 289-309.

Celce-Murcia, M., & Larsen-Freeman, D. (1999). *The grammar book: An ESL/EFL teacher's course* (2nd ed). Boston, MA: Heinle & Heinle.

Celce-Murcia, M., & Olshtain, E. (2000). *Discourse and context in language teaching: A guide for language teachers.* Cambridge: Cambridge University Press.

Cook, G. (2007). Languages in the contemporary world. *Applied Linguistics*, *3,* 21-30.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed methods approaches* (2nd ed.).Thousand Oaks, CA: Sage.

Creswell, J. W. (2007). *Educational research* (3rd ed.). Thousand Oaks, CA: Sage.

Crewe, W. J. (1990). *The illogic of logical connectors.* Oxford: Oxford University Press.

Crewe, W., Wright, C., & Leung, M. (1985). Connectives: On the other hand, who needs them, though? *Working papers in Linguistics and Language Teaching, 8*, 61-75.

Crystal, D. (2002). *The English language: A guided tour of the language.* London: Penguin Books.
Demirci, M. & Kleiner, B. (1997). Discourse markers in second language research. *Journal of Intensive English Studies, 11*, 131-142.
Enkvist, N.E. (1990). Seven problems in the study of coherence and interpretability. In U. Connor & A.M. Johns (Eds.), *Coherence in writing*: *Research and pedagogical perspectives* (pp. 9-28). Alexandria, VA: Teachers of English to Speakers of Other Languages.
Field, Y., & Yip, L. (1992). A comparison of internal conjunctive cohesion in the English essay writing of Cantonese speakers and native speakers of English. *RELC Journal*, *23*(1), 15-28.
Finch, G. (2000). *Linguistic terms and concepts.* New York: St. Martin's Press.
Granger, S., & Tyson, S. (1996). Connector usage in the English essay writing of native and non-native EFL speakers of English. *World Englishes, 15*(1), 17-27.
Halliday, M., & Hasan, R. (1976). *Cohesion in English.* London: Longman.
Hartnett, C. G. 1986. Static and dynamic cohesion: Signals of thinking in writing. In B. Couture (Ed.), *Functional approaches to writing* (pp. 142-151). London: Pinter.
Hellman, C. (1995). The notion of coherence in discourse. In G. Rickheit, & C. Habel (Eds.), *Focus and coherence in discourse processing* (pp. 190-202). Berlin & New York: de Gruyter.
Hoey, M. (1991). *Patterns of lexis in text*. Oxford: Oxford University Press.
Huddleston, R., & Pullum, G. (2002). *The Cambridge grammar of the English language* Cambridge: Cambridge University Press.
Kenya Institute of Education (2002). *Revised English syllabus for Kenya secondary schools.* Nairobi: Kenya Literature Bureau.
Khajehei, H., & Shakarami, A. (2012). An in-depth linguistic analysis of the thematic connectivity in the holy Quran. *Academic Research International*, *2* (2), 2-75.
Kolln, M. (1999). Cohesion and coherence. In C. Cooper & L. Odell (Eds.), *Evaluating writing* (pp. 93-113). Illinois: National Council of Teachers of English.
Kothari, C.R. (2004). Quantitative techniques. New Delhi, Vikas Publishing House Ltd.
Leech, G., & Svartvik, J. (1994). A communicative grammar of English. London / New York: Longman.
Mallick, K., & Verma, G. K. (1999). *Researching education: Perspectives and techniques.* London: Falmer.
Marshall, C., & Rossman, G. (1999). *Designing qualitative* research (3rd ed). London: Sage Publications.
Mauranen, A. (1993). *Cultural differences in academic rhetoric: A text linguistic study*. Frankfurt am Main: Peter Lang.
Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco: Jossey-Bass.
Neuner, J.L. (1987). Cohesive ties and chains in good and poor freshman essays. *Research in the Teaching of English, 21*, 92-103.
Tella, J., Chisikwa, F., & Othuon, L. (2010). Relationship between students' perspectives on the secondary school English curriculum and their academic achievement in Kenya. *Educational Research*, *1*(9), 390-395.
Thornbury, S. (2005). *How to teach speaking*. England: Pearson Educational Limited.
Wikborg, E. & Björk, L. (1989). *Sammanhang i text. En empirisk undersökning och skrivpedagogiska konsekvenser*. Uppsala: Hallgren & Fallgren.
Yankova, D. (2006). Semantic relations in statutory texts: A study of English and Bulgarian. *SKY Journal of Linguistics 19*, 189-222.
Zamel, V. (1984). Teaching those missing links in writing. In S. McKay (Ed.), *Composing in a second language* (*pp*. 110-122). San Francisco State University, Cambridge: Newbury House.

Appendix A: Pretest

Join each of the following pairs of sentences using the correct sentence connector

1. The cost of living has gone up. Many families are having financial problems.
2. I tried to warn the rangers not to use the road by sending a written note. I sent a smoke signal**.**
3. Fran ignored the doctor's advice and refused to take the prescribed medication. He is complaining about not getting better.
4. She was an orphan. She was well behaved as any other child.
5. I dislike filling in questionnaires. I agreed to help Moina do her research.
6. The singers stopped to rest. The drummers stopped
7. The building collapsed that morning; consequently, the live performance was cancelled.

8. Many companies do not provide lunch for their employees. They provide cafeteria services within their premises.
9. He didn’t get proper sleep that night. He chaired the meeting successfully.
10. It was raining very hard. The children did not go to school**.**
11. The careless driver argued with the police. He was arrested.
12. They lost the war because they did not plan well. They did not have enough soldiers.
13. Warm the water for about two minutes. Add a pint of milk.
14. Groundnuts can be used to make a variety of sauces. They can be used as snacks.
15. Kenya is a good tourist destination because of its wildlife. It has a national park within its capital City.
16. They refused to pay for their licences. Their businesses were closed down.
17. Our college offers preparation for the professions, business and industry. Students can prepare for transfer to a university.
18. Working full time for most breastfeeding mothers can be stressful. Many of them have learnt to manage their stress levels.
19. They lost the war because they did not plan well. They did not have enough soldiers.
20. She is our Member of Parliament. We expect her to air our grievances.

Appendix B: Expected Answers for Pretest

1. The cost of living has gone up; **as a result,** many families are having financial problems. (Causal)
2. I tried to warn the rangers not to use the road by sending a written note; **in addition,** I sent a smoke signal. **(Additive)**
3. Fran ignored the doctor’s advice and refused to take prescribed medication; **consequently,** he is complaining about not getter better. (Causal)
4. She was an orphan; **in spite of that,** she was as well behaved as any other child with parents too. (Adversatives)
5. I dislike filling in questionnaire**; although,** I agreed to help Moina do her research. . (Adversatives)
6. The singers stopped to rest; **similarly,** the drummers stopped. (**(Additive)**
7. The building collapsed that morning; consequently, the live performance was cancelled. **(Temporal)**
8. Many companies do not provide lunch for their employees; **however,** they provide cafeteria services within their premises. (Adversatives)
9. He didn’t get proper sleep that night; **nevertheless,** he chaired the meeting successfully. **(Temporal)**
10. It was raining very hard; **therefore,** the children did not go to school**. (Causal)**
11. The careless driver argued with the police; **thus,** he was arrested. **(Causal)**
12. They lost the war because they did not plan well; **firstly,** they did not have enough soldiers**. (Temporal)**
13. Warm the water for about two minutes**; after that,** add a pint of milk. **(Temporal)**
14. Groundnuts can be used to make a variety of sauces; **besides,** they can be used as snacks **(Additive)**
15. Kenya is a good tourist destination because of its wildlife. It has a national park within its capital City. **(Additive)**
16. They refused to pay for their licenses. Their businesses were closed down. **(Causal)**
17. Our college offers preparation for the professions, business and industry; **moreover,** students can prepare for transfer to a university. **(Additive)**
18. Working full time for most breastfeeding mothers can be stressful; **nevertheless**, many of them have learnt to manage their stress levels. (Adversatives)

19. They lost the war because they did not plan well; **firstly,** they did not have enough soldiers. **(Temporal)**
20. She is our Member of Parliament; **therefore,** we expect her to air our grievances. **(Temporal)**

Appendix C: Connectors in an Essay

Complete the following passage with appropriate connectors

[1]**…………**in school we are taught to be kind to animals, paradoxically while we preach kindness we practice butchery. [2]**………………**there are experiments in the Biology Laboratory in which the frog's brain is destroyed while the animal is still alive; to test its reflex action. [3]**……………..**live insects are pinned on boards to study their different organs. Vivisection of animals has become an integral part of the Science syllabus. [4]… the more advanced the course gets, the more brutal the experiments on animals become. The mouse is often the victim. It is not uncommon to find mice kept under deplorable conditions for the purpose of experimentation. [5]**…** there are reasons that would back up the use of animals in experiments.[6] **…………** the health service benefits [7]**…………..**the health service benefits from animal - tested and anima-derived medicines**.**[8]**…**hospitals stay of patients is greatly reduced and home treatment is made possible. Diseases such as pneumonia, measles and whooping cough have remedies (courtesy of the animal-experiment.) [9]**………………..**children have benefitted most through the vaccines produced.[10]..**…………..**If practiced with moderation, animal experiments would be acceptable.

Appendix D: Expected answers for the Connectors in an Essay

[1]**Although** in school we are taught to be kind to animals, paradoxically while we preach kindness we practice butchery. [2]**To begin with,** there are experiments in the Biology Laboratory in which the frog's brain is destroyed while the animal is still alive; to test its reflex action.[3] **In addition** live insects are pinned on boards to study their different organs. Vivisection of animals has become an integral part of the Science syllabus. [4]**Consequently,** the more advanced the course gets, the more brutal the experiments on animals become. The mouse is often the victim. It is not uncommon to find mice kept under deplorable conditions for the purpose of experimentation. [5]**However,** there are reasons that would back up the use of animals in experiments. [6] **First, the** health service benefits. [7] **Indeed** the health service benefits from animal - tested and anima-derived medicines**.** [8] **Moreover,** hospitals stay of patients is greatly reduced and home treatment is made possible. Diseases such as pneumonia, measles and whooping cough have remedies (courtesy of the animal-experiment.) [9] **In fact** children have benefitted most through the vaccines produced. [10] **All in all** if practiced with moderation, animal experiments would be acceptable.

Appendix E: Experimental Group

NAME	Pretest	Posttest	Diff
Student 1	11	16	5
Student 2	12	18	6
Student 3	13	17	4
Student 4	11	18	7
Student 5	10	13	3
Student 6	11	14	3
Student 7	12	16	4
Student 8	09	14	5
Student 9	10	16	6
Student 10	12	17	5
Student 11	13	16	3
Student 12	10	15	5
Student 13	12	15	3
Student 14	11	15	4
Student 15	11	16	5
Student 16	15	20	5
Student 17	13	16	3
Student 18	11	15	4
Student 19	13	18	5
Student 20	16	20	4
Student 21	16	20	4
Student 22	13	18	5
Student 23	14	18	4
Student 24	15	19	4
Student 25	15	19	4

Appendix F: Control Group

NAME	Pretest	Posttest	Diff
Student 1	11	14	3
Student 2	11	14	3
Student 3	15	18	2
Student 4	13	18	5
Student 5	12	15	3
Student 6	13	16	3
Student 7	16	18	2
Student 8	16	19	3
Student 9	13	17	4
Student 10	14	18	4
Student 11	15	17	2
Student 12	11	15	4
Student 13	12	15	3
Student 14	13	16	3
Student 15	11	16	5
Student 16	10	15	5
Student 17	11	14	4
Student 18	12	15	3
Student 19	12	16	3
Student 20	12	15	3
Student 21	12	16	4
Student 22	13	18	5
Student 23	10	15	5
Student 24	12	15	3
Student 25	13	15	2

HOW DOES NOTATIONAL COMPETENCE AFFECT STUDENT UNDERSTANDING AND PERFORMANCE IN MATHEMATICS?

Joash Mochogi Geteregechi
Kenyatta University
jmochogi@gmail.com

Marguerite Miheso-O'Connor
Kenyatta University
Miheso.marguerite@ku.ac.ke

Samson Rosana Ondigi
Kenyatta University
ondigi@yahoo.com

Mathematics is a discipline that communicates using a highly specialized language. This language makes use of notations and symbols in unique ways that require thorough understanding by those studying it. This study was designed to measure how student mastery of the notations relates to their performance in mathematics. The study used a correlational study design where competence in notations was correlated with performance. Competence in notations and performance in mathematics were measured using tests designed to measure the two. The findings indicate that student mastery of notations highly correlates with their performance in the subject thus recommending that they should be taken more seriously by teachers and authors of mathematics textbooks.

Key words: Mathematical Notation, Mathematical Language, Symbolism, Notational Competence and Mathematics Performance.

Introduction

Mathematical knowledge is an important requirement amongst members of any society (Geteregechi, 2013). This knowledge is crucial since it has a wide range of applications. For instance, mathematical knowledge is a requirement for employment, in the study of other subjects, for communication, among others (Bell, 1983). It is due to this fact that mathematics has been made a core subject in many education systems in the world. It is for the same reasons that many colleges and universities across the world offer more mathematics lessons than any other subject (A. Orton, D. Orton, & Frobisher, 2004). However, unsatisfactory performance in mathematics amongst students has been a concern for a long time not only in specific countries but also on a global platform (Pisa, 2003).

Researchers in mathematics education have identified several factors responsible for students' poor performance in mathematics. Among these factors are teachers and students' attitude towards the subject (Mohamed and Waheed, 2011), teachers' proficiency in pedagogical content knowledge (Miheso-O'connor, 2009), motivation to learn and teaching methods (including use of technology). Studies focusing on the influence of mathematical language, and notations in specific, have been extremely rare. Part of the reason for the lack of studies in this area is the notion that since mathematics deals with symbols and notations, they are always explained in the text or by the teacher (Chirume, 2012). However, a closer look of students' work shows that more often than not, majority of students do misuse mathematical symbols and notations. For example, according to Geteregechi (2013), when students were asked to fill the blanks in the question 7+4 = [] +5 = [], majority of them filled the first blank with 11 and the next one with 16. This is an indication that the students did not understand the equal sign as an equality of quantities on the either side of the equation. Another commonly misused notation is the square root (√) sign, in which students work out the root but retain the √ sign in their final answer, for example √25 = √5. This could also be an indication that, while the students may have known the process of finding the square root of a certain quantity, they have not learnt how to express this mathematically. Research into this area of mathematics is required, thus the aim of the current research.

Importance of Notations to the Learning of Mathematics

Mathematical notations form part of the wider mathematical language. However, most researchers exploring the field of mathematical language within the mathematics education community have paid attention only to the syntactic and semantic part of the language, that is, the meaning and use of various terminologies in different contexts in mathematics (Njoroge, 2003). Since symbols and notations lie at the heart of mathematics, their use in its study is therefore, inevitable. Although a few researchers have paid attention to notations, even fewer have looked at how competence in these notations relates to student performance in mathematics. The focus of this study was how secondary school students' mastery of mathematical notations impacts their understanding and achievement in mathematics.

According to Muller and Kohlhase (2008), depending on the context, mathematical notations form 30 to 60% of any mathematical text. Hence, for someone to effectively decode mathematical text, they must be well versed with the notation. The main purpose of these notations is to cut short what would otherwise be long and bulky sentences (Chirume, 2012) into fewer characters to enhance communication. Although the notations are supposed to enhance communication, they may however, achieve the contrary by complicating communication and acquisition process (Muller and Kohlhase, 2008). In mathematics classrooms, student familiarity with such notations is crucial if they are to understand mathematics (Stage, 2001) and articulate the mathematical ideas properly. It also allows them to do independent studies effectively as some books make use of notations without explaining their meaning in different contexts (Geteregechi, 2013). In a classroom set up, as the teacher talks, he/she writes on the board. However, the teachers usually speak a lot but end up writing very little in form of notations- they literally 'speak' the notations. For example '=' is spoken as '**equals to**', while '√' is spoken as '**the square root of**'. If students are unfamiliar with, or have a different understanding of some notations used during mathematics lessons, they are likely to learn very little, or nothing at all due to poor communication and misrepresentation of mathematical concepts and processes.

An example in which misuse/misinterpretation of notation leads to hampered communication and subsequent failure is provided below:

> The notation **'!'** means factorial while the notation **'%'** means percentage. Therefore, 4! = 4 x 3 x 2 x 1 = 24 while 4% = 4/100 = 0.04. In this case, the notations represent mathematical operations/processes. If a student takes **'!'** for '**%**', they will definitely fail regardless of whether or not they know how to perform the operations **factorial** and **percentage**. This is a likely situation since it is possible to have such notations used in examinations without their names being given. Such misunderstanding and confusion may arise during classroom teaching if the teacher does not emphasize on what various notations stand for and how the notations are used in various contexts within mathematics. For instance, the use of **-1** as a superscript may have different meanings depending on the context. For example, if '**y**' is a number, then $\mathbf{y^{-1} = 1/y}$ holds but if '**y**' is a function, then $\mathbf{y^{-1} = 1/y}$ does not hold.

Communication in a Mathematics Classroom

During a mathematics lesson, teachers and students share information. The teacher sends information to the students and the students send feedback. By using feedback from the students, the teacher clarifies misunderstandings and misconception amongst students with an aim of creating shared meaning. Mathematical language plays a crucial role during this communication process. Unlike other languages such as English, mathematical language makes use of specialized symbols and notations in a specialized manner (Esty, 2011, Chirume, 2012). Student mastery of such symbols and notations is crucial if effective learning is to take place.

Figure 1 shows how, during a classroom discourse, the use of notations may hamper or enhance learning:

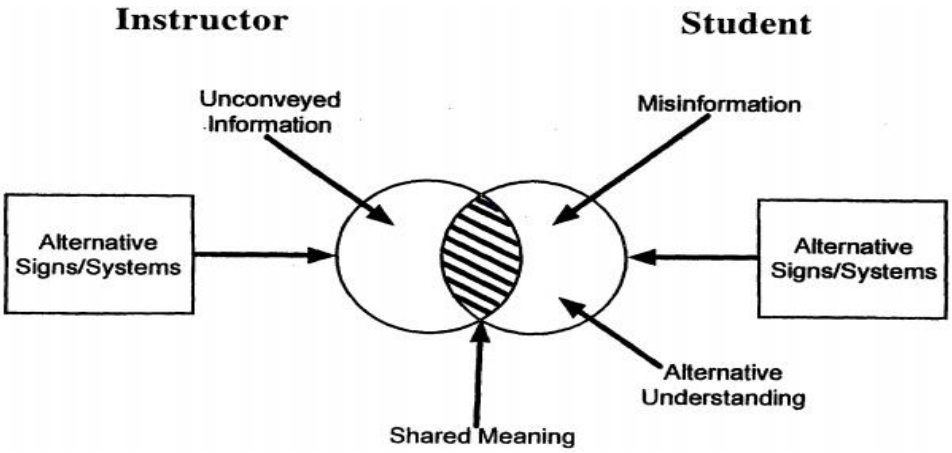


Fig.1: A Semiotic View of Mathematics Learning - *Adapted from Stage (2001)*

According to the figure, the interaction between students and the teacher during a mathematics lesson is aimed at creating shared meaning. This is represented by the shaded region. The bigger this region is, the better the understanding of the symbol system and hence better communication. Students with a bigger shared meaning may be said to be more competent in mathematical notation. However, there could be some misinformation on the part of the student or un-conveyed information on the part of the teacher. Students in this category misuse mathematical notation by misrepresenting concepts and mathematical operations. This distorts meaning and hence leads to failure. The role of the teacher therefore, is to try as much as possible to increase the shared meaning of the notational system. This study set out to find out the relationship between students competence in mathematical notation and their performance in mathematics.

The difficulties associated with notations include the fact that the mathematical community has not been able to take full control of them. Several notations are known to cause ambiguities and misunderstanding amongst learners (Chirume, 2012). It is common practice to have mathematicians from different parts of the world using different notations in expressing the same mathematical ideas. By so doing, these notations hamper communication during the learning process. If notations were to be controlled and harmonized, their use would cause less confusion and hence enhance student learning and performance in mathematics.

Methods

Study Design and Sample Size

The current study is a quantitative correlational study that sought to find out whether secondary school students' competence in mathematical notation was related to their performance in the subject. The study was carried out amongst the form two students in Nyamira North Sub-county in Kenya. The researcher sampled 340 students out of an accessible population of 2941 form two students in the sub-county. The sampled students were drawn from seven schools. The sub-county had a total of thirty-seven schools by the time the study was conducted.

Research Instruments

Data was collected using two distinct diagnostic tests. The first test measured student competence in mathematical notations while the second test measured student performance in mathematics. The Notations Competence Test (NCT) was made up of two sections. The first section measured student ability to convert mathematical word statements into notation form while the second part measured their ability to convert notational statements into word format. The total score from the two sections was computed into a percentage and used as the students' competence in mathematical notation. The second test was a Test of Performance (TOP). The items in this test were obtained with slight modifications from the Kenya National Examinations Council (KNEC), which is a credible examining body in Kenya. This made the test valid. Both tests were subjected to a pilot study after which relevant modifications were made. Their reliabilities were also computed using the Kuder-Richardson formula 20 and found to be high (TOP, $\alpha = 0.89$, NCT, $\alpha = 0.82$).

Data Collection

The instruments were administered to the sampled students with the help of their teachers of mathematics. This was done in the evening during the official school breaks. The two tests were administered on different days starting with the Notations Competence Test (NCT) and then the Test of Performance (TOP). Students were allowed enough time to finish all the tasks in the instruments.

Results and Discussion

In this section, the analysis of the data and results are presented. This analysis focused on demographic characteristics such as gender and age, student performance on the NCT and TOP as well as the correlation of the scores using Pearson's product moment coefficient.

Demographics of the Sample

The demographics considered in this study were student's gender and age. These characteristics are provided alongside the mean scores both in the NCT and the TOP. Table 1 shows how these were distributed:

Table 1: Demographic Characteristics

Characteristic	Levels	Frequency	Percentage of Total	NCT Score (%)	TOP Score (%)
Gender	Male	204	60	61	62
	Female	136	40	42	49
Age (Years)	13-15	219	64.4	50	57
	16-18	101	29.7	47	53
	≥ 19	20	5.9	40	41

From Table 1, that there were more male students (60%) than female students (40%). On performance, it is evident that male students outperformed their female counterparts both in the NCT and the TOP.

There were more students aged 13-15 (64.4%) than there were in the age brackets 16-19 (29.7%) and above 19 (5.9%). In Kenya, most students join secondary school at the age of 13 and 14. This therefore accounts for this high number of students at 13-14. However, there were also some students aged over 19 years. Although repetition of classes, without the consent of the parent and student, is not allowed in Kenya, it has been reported that some schools do force students to repeat when they do not perform well. This pressure by teachers on students to perform stems from the ministry of education, which promotes and demotes teachers based more on student performance in academic work than other competences. Another possible explanation to this is that since the government of Kenya introduced free secondary education, many students who had opted out of school due to lack of school fees decided to enroll and continue with their studies. The students aged over 19 posted the least scores both on the NCT and TOP. Again, this could be explained by the fact that they have been out of school for long and are therefore rusty in mathematics.

Student Competence in Notations Versus Performance in Mathematics

In order to find the relationship between student's competence in mathematical notations and their performance in mathematics, the researcher used Pearson's product moment coefficient. The Statistical Package and Software Solution's (SPSS) output for the correlation between students' NCT scores and the TOP scores were as shown in table 2:

Table 2: Correlation Between Student Competence in Mathematical Notation and Performance in Mathematics

		Mathematics Performance	Competence in Notations
Mathematics Performance	Pearson Correlation	1	.887**
	Sig. (2-tailed)		0
	N	340	340
Competence in Notations	Pearson Correlation	.887**	1
	Sig. (2-tailed)	0	
	N	340	340

** Correlation is significant at the 0.05 level (2-tailed)

Table 2 shows that the correlation between students' competence in mathematical notation and performance in mathematics is strongly positive ($r = 0.887$). This relationship was found to be significant at $\alpha=0.05$. The implication of this therefore, is that high competence in mathematical notations leads to higher achievement in mathematics. It can be inferred that, students who are competent in mathematical notation find the reading, listening and writing of mathematical ideas/statements easier than their counterparts who are not. Similar findings have been supported by Chirume (2012), who in his study reported that student misunderstanding and subsequent misuse of symbols and notations could hinder student understanding and even lead to low achievement in mathematics. Luna and Fuscablo (2002) conducted a study on mathematical notation and recommended that they should be integrated in other subjects and topics at the start of a given course as this will allow better understanding of the concepts involved. According to Foster (2007), the teaching of algebraic concepts should be accompanied with effective articulation of symbols and their use as this gives students a deeper understanding of the concepts and lead to higher performance.

Conclusion and Recommendations

This study was designed with the main aim of establishing the relationship between student competence in mathematical notation and achievement in mathematics. The findings indicate that there is a strong positive correlation between the notational competence and achievement. The study therefore, strongly recommends that teachers of mathematics and textbook authors should present a thorough articulation of all notations and symbols that they use. This should be done probably at the beginning of the textbook or each topic in the book.

References

Bell, A. W., *A review of Research in Mathematics Education: Part A: Research on Learning and Teaching Mathematics.* Oxford: Nfer-Nelson Publishing Company. (1983).

Chirume, S. (2012). How does use of mathematical symbols influence understanding of mathematics by secondary school students? *International Journal of Social sciences and Education*, 3(1).

Esty, W., (2011). *The Language of Mathematics.* URL: http://www.augustusmath.hypermath.net

Stage F.K. (2001) Symbolic Discourse and Understanding in a College Mathematics Classroom. *The Journal of General Education*. 50(3), Retrieved from: http://www.jstor.org/stable/27797880.

Muller and Kohlhase (2008). Context Aware Adaptation: A case study on Mathematical; Notations. *Centre for Discrete Mathematics and Theoretical Computer Science* (CDMTCS) Research Report Series-341, Nov 2008).

Njoroge, B. (2003). *Relationship between Mathematical Language and Students' performance in Mathematics in Public Secondary Schools in Nairobi Province, Kenya.* Masters Thesis, Kenyatta University. Kenya. Pp. 27

Luna, C.A. & Fuscablo, L.G., (2002). Enhancement of Student Problem Solving Performance through Mathematical Symbolism. *Proceedings of ICME10-Topic Study Group 9*, pp . 1-10.

Foster, D. (2007). *Making meaning in Algebra examining students" understandings and misconceptions. Assessing Mathematical Proficiency*. 53 , 163-176 Retrieved from http://www.msri.org/communications/books/Book53/contents.html

Stage, F.K., (2001). Symbolic discourse and understanding in a college mathematics classroom. Journal of General Education. 50(3), Retrieved from http://www.jstor.org/stable/27797880.

CHEMISTRY TEACHERS' ROLE IN CHANGING PRACTICAL WORK FROM "HANDS ON" ACTIVITIES TO "MINDS ON" ACTIVITIES

Monica Ituma
Kenyatta University
monicaituma@gmail.com

Nicholas Twoli
Kenyatta University
nicholastwoli@yahoo.com

Practical work is important in the effective learning of Chemistry. In most Kenyan secondary schools practical work mainly involves 'hands on' activities where learners follow laid down procedures to arrive at a predetermined outcome. This may lead to working without much thought of the actions and thus low conceptualization resulting in poor performance in chemistry at the end of the course. This study aims at providing alternative approach on how to engage the learners' mind more in practical activities. Data was collected through observations of practical lessons, followed by analysis of instructional materials used by chemistry teachers and questionnaires for the chemistry teachers. The findings showed that the strategies used to teach practical work did not adequately focus on the learners' 'minds on' the activity. The teachers, therefore, require design and resource support for the implementation of learner-centred investigative practical work in secondary school chemistry.

Keywords: Instructional Materials, "Minds On" Practical Activities, Practical Investigations

Introduction

In order for chemistry practical work to be effective in producing meaningful learning, the teachers should develop activities that engage the learners in scientific investigations in which their minds are focused on the activity and its outcome. Science educators argue that practical work should involve learner-cantered learning environment that engage students in knowledge construction, as opposed to teacher-centered environment which involves information absorption (Gravoso et al 2008). Conventional methods of teaching practical work used in most Kenyan secondary schools mainly focuses on developing students' knowledge in chemistry, rather than on developing understanding of scientific investigative procedures. The practice in practical work has been a cookbook trend where the instructions are carried out like a recipe that reduces meaningful learning. The learners therefore, do not use scientific ideas to guide their actions during the practical activity and to reflect upon the data they collect. Kim & Chin (2011) argue that this nature of recipe-based practical work is not sufficient to develop students 'habits of mind' because they involve simply doing but do not require thinking through doing. Effective practical activities should enable students to build a bridge between what they can see and handle (hands-on) and scientific ideas that account for their observations (brains-on).

Need to Support Investigative Practical Work

There has been continued poor performance in chemistry at the end of course examination in Kenya indicating that the learning of chemistry may not be as effective as required. Studies indicate that use of investigative approaches of science learning through practical work is a means of improving learning in chemistry (SCORE, 2007). Investigative inquiry approaches to learning the content and process of science has been central in the recent years yet the challenges to investigative teaching are still evident and the shift from traditional expository methods has been slow (Krajcik et al 2003). Hubber & Moore (2001) argue that 'hands on' activities in science practical work do not guarantee scientific investigation. This points to a need to support teachers in use of learner centered investigations. Motswiri (2004) argues that classroom practices in most secondary school chemistry lessons are characterized by chalk-and-talk and little practical work. In cases where practical work is implemented, it only requires students to follow instructions developed by the teacher or from textbooks where the learners are supposed to strictly carry out the activities as per the instructions; sometimes without much interest or thought on what they are doing. Learners tend to follow the teacher's guidance to the letter. It is therefore of paramount importance to change the teachers' practice in order to achieve 'minds on' learning of practical chemistry.

Changing practical activities to 'minds on' type requires proper management of all stages of the activity. Practical work is usually carried out in four main stages (Twoli, 2006; Omosewo, 2006); planning, implementation/activity, discussions and conclusions. When these stages are well managed they can lead to conceptualization (Figure 1).

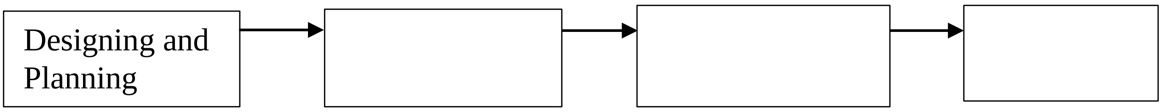


Figure 1: Development of Understanding of Scientific Principles Through Practical Work

Krajcik et al (2003) noted that research-based curriculum materials could address these challenges and provide improved tools for learning for teachers and students through development of appropriate instructional designs. Instructional materials can serve as learning materials for both students and teachers. Materials can also serve as a primary influence on how teachers should teach science (Krajcik et al 2003). Yandila et al (2003) quoted teachers as facing difficulties in implementation of learner-centered approach due to, among other factors, lack of exemplary teaching materials and inappropriate textbooks.

Aim of the Study

The main aim of this study was to develop insights into the characteristics of instructional strategies that would support teachers to engage learners in use of learner centered investigative practical work in the secondary school chemistry.

Study Location and Population

The study was carried out in Kajiado County in Kenya. The 42 public schools managed by the government were taken as the study population. From a sample of 19 schools, 42 teachers responded to a questionnaire and lesson observations were carried out in six schools. 47 teachers carried out the first appraisal of the materials and 3 experienced teachers carried out the second appraisal of the materials. The first try out of materials was done by three teachers who taught a total of twelve lessons. The second classroom use that involved evaluation of the strategies was carried out by five teachers in which a total of 30 lessons were observed.

Conceptualization of the Study

Considering that this study aimed at defining the characteristics of learner centred instructional strategies and how they can be developed and used, the study focused on instructional design strategy that involves designing, developing and evaluating instructional material prototypes. Such developmental research characterizes the situation with all its complexity instead of identifying a few variables to hold constant (Aksela, 2005; DBRC, 2003). The study considered the content of instructional materials for practical work and teaching strategies (including student engagement in designing practical work) as the conditions that affect understanding of concepts and acquisition of skills (learning outcome). Instructional strategies were designed in the instructional materials and developed through various stages to produce refined model of instructional materials that contain strategies for investigative practical work.

Methodology

This study employed a Design-Based Research (DBR) design. Design-Based Research is one terminology used to describe a research methodology that is used to design/develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) with the aim to solve a complex educational problem and to advance knowledge about the characteristics of these interventions and the processes to design and develop them (Plomp & Nieveen 2007). Some scholars also refer to this research design as developmental research design (Wang & Hannafin, 2005; Motswiri, 2004). DBR design was appropriate because it helped create and extend knowledge about developing, enacting, and sustaining innovative learning environments (DBRC, 2003). DBR has an advantage of offering solutions to real life problems because the research is carried out in real life setting where learning is done, it has multiple dependent variables, it characterizes the situation with all its complexity and it involves different participants in the design who bring in differing expertise instead of being subjects of study. It is a flexible design for revision in which tentative initial set is revised depending on success (Krajcik et al, 2007; DBRC, 2003). DBR emphasizes the participatory role of practitioners. Teachers and students can become re-designers by collaborating with researchers (Aksela, 2005). Based on constructivism theory of teaching and learning, practical work instructional materials that support investigative learner-centred teaching strategies were developed.

A construct referring to step-by-step prescriptive procedure for creating instructional materials in a consistent and reliable fashion in order to facilitate learning is referred to as an instructional design model. The five basic phases of Instructional Design Model were used in the study (Gustafson and Branch 2002). The first stage involved assessment of the practices and needs of Chemistry practical work in schools. This was done through use of questionnaires for teachers, lesson observations and analysis of content in the books commonly used by teachers in chemistry teaching. Stage two involved design and development of Chemistry practical work instructional materials prototype. Design specifications were developed based on the outcome of stage one analysis, constructivism theories and state-of-the-art knowledge about teaching of science. From the specifications, the first prototype of the materials was developed. These were appraised by teachers. After the appraisals, the materials were refined and developed into a second prototype. The third stage was the try-out of the second prototypes with chemistry teachers in the form one classes. The feedback from these try-outs were used to refine the materials further thus development of the third prototype. The fourth stage involved evaluation of the instructional strategies. This was carried out in the classrooms as chemistry teachers used the materials to support their implementation of learner centred investigations. The evaluation was done using lesson observation, teacher logbook, teacher's interview and student questionnaire. The feedback was used for the refinement of the materials leading to a model of instructional materials that support learner centred investigative work.

Findings

Use of Practical Work in Chemistry

All teachers indicated that they used some form of practical work in teaching chemistry. This implies that teachers attach a lot of value to the practical work in chemistry teaching. When asked about the method they used to teach chemistry practical work, the highest percentage of the teachers (64.3%) indicated that they commonly used demonstration method despite acknowledging that class experiments would produce better learning of chemistry concepts. A small percentage (21.4%) of teachers indicated that they commonly used class experiments. Project work was rarely used by the teachers (Figure 2).

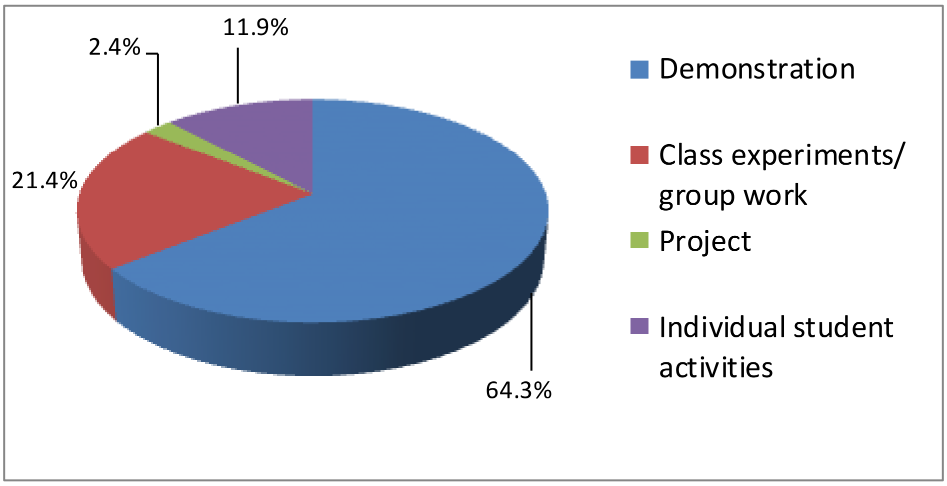


Figure 2: Methods Used to Manage Instruction in School Chemistry Practical Work

Practical work involved placing learners into groups and providing them with detailed procedures to follow. Responses to questionnaire items showed that most teachers (80.9%) believed that providing learners with detailed procedures to follow leads to their engagement in learning. It is however important to note that merely placing learners in groups does not lead to practice of inquiry (Wachanga & Mwangi; 2004). Educationists argue that following strictly set procedures to arrive at a predetermined outcome is limiting and does not lead to meaningful learning in science (Hubber & Moore, 2001; Trowbridge et al, 2004; Motswiri 2004; Chiapetta & Koballa, 2010). There are some common practices observed during chemistry practical lessons in secondary school chemistry. The frequencies with which these practices are carried out depend on how the teacher organizes the learning activities. For the practical lessons observed frequencies of these practices was as shown in Figure 3.

Many teachers (71.4%) never allowed the learners to develop their own procedures, or carry out procedures that interested them. Some teachers did not even allow learners to question the procedures they were given. This indicates that the learners may not actively engage their minds during the practical activity. This method has been referred to as providing ‘hands on’ and not ‘minds on’ activities (Chiapetta & Koballa, 2010).

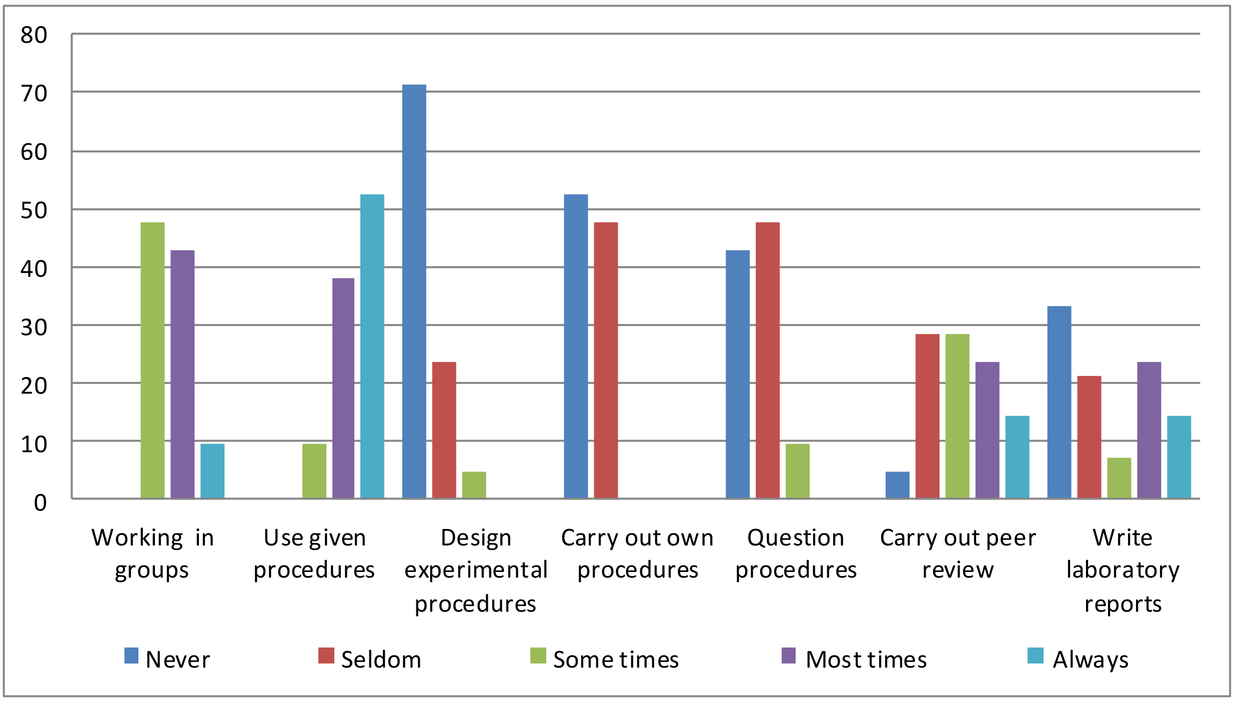


Figure 3: Common Practices Carried Out in Secondary School Chemistry Practical Work

The study further showed that teachers did not have laboratory manuals that they could use for practical work. They used chemistry textbooks that are approved by Kenya Institute of Curriculum Development (KICD). Most of the practical activities in these materials appeared to be geared towards confirmation of facts and ideas and therefore provide detailed step-by-step experimental procedures. Most of the teachers (81.0%) indicated that the expected results of the practical activity were clearly outlined and most learners work towards getting the results indicated in the book. The books were found to emphasize mainly on manipulative skills and observation lacking emphasis of important skills of predicting/hypothesizing, creativity and imagination, as well as application of scientific facts. Such materials do not provide learners with an opportunity to develop their own procedures for practical activity or look for alternatives to procedures given and do not encourage thoughtful reflection on experience. This indicates the need for special instructional material support for practical work in chemistry teaching and learning. The lessons observed indicated that teachers used the textbook as guide for structuring their lessons. Learners were not accorded opportunities to engage in scientific arguments and support the outcome of their experiments. Similar weaknesses concerning instructional materials have been noted by other researchers (Motswiri, 2004; Krajcik et al, 2003).

Design and Development of Instructional Materials that Support Investigative practical Work

Having established the convectional materials and practices, the researcher set out to develop an initial prototype of the instructional materials that would support teachers in implementing investigative practical activities in chemistry. These were designed as a set of six lessons from the topic, *acids, bases and indicators.* This is a topic in Form One KCSE syllabus. The design specifications for the materials were informed by needs for chemistry teaching and learning of practical work as identified from stage one of study, constructivism theory of learning, and literature on by other researches (Reiser, et al 2003; Motswiri, 2004; Ottevanger, 2013, Davis et al, 2014). The design specifications included a focus on: science content, scientific practices, scientific literacy practices, participation structures and assessment opportunities:

The features of appropriate instructional materials were adapted. These are pedagogical appropriateness, appropriate science content and presentation and format (National Science Resources Center, 1997; National Academy of Sciences, 1998). A number of evaluation processes were carried out (Nieveen, 1997; Motswiri, 2004; Ottevanger, 2013). The first was expert appraisal in which experienced teachers appraised the materials and identified areas that required review and improvement. The appraisal was guided by a structured questionnaire that mainly comprised open-ended questions and an informal interview. The results indicated that the materials reflected the KCSE syllabus and could be used in the classroom. Suggestions were made for adjustments of materials that were to be used for practical experiments. There was a general agreement that the materials would be instrumental in guiding the teacher through discussions during the lesson and in helping learners build information on their prior knowledge.

Science education lecturers from the university also appraised the materials with the purpose of enhancing consistency of the materials and research instruments. Their views were used to review and redesign the materials producing a second prototype. Three teachers tried out this prototype with their students in their classrooms. This focused on the practical usability of the materials in the chemistry classes. The results were used to review the materials producing the third prototype. This prototype was taken for a field test where evaluation of practicality and effectiveness were carried out. Five teachers in their classrooms used the instructional materials for a series of six lessons. The results of the evaluation were used to refine the materials further producing the final version. These evaluation activities in the study were embedded in a cyclic approach of design and formative evaluation for the development and refinement of the instructional strategies for learner centered investigative practical work.

Evaluation of the Materials

The instructional materials consisted of the teacher guide and student materials that composed six practical lessons covering the topic of acids, bases and indicators. The teacher‘s guide provided detailed procedures on how to guide the learners through each step of the investigative process including predicting/ hypothesizing and formulation of procedures to use for the activity. The evaluation involved use of the materials with five teachers in their chemistry classes. This involved a total of 144 learners. A total of 30 lessons were carried out. The evaluation of the materials was carried out to determine the instructional support the materials provided in achieving learner centered investigative practical work. The key criteria for this evaluation were guided by determination of practicality and effectiveness of the materials in actual classrooms (Krajcik et al, 2003; Nieveen, 1999; Otteavenger, 2013). Practicality was evaluated as measure of the materials' quality, which was indicated by support, clarity, congruence, complexity, and cost as perceived by the teacher using it in the context of his or her practice.

Lesson observation schedule was used to guide the recording of observations made during the practical activity. The teacher was provided with a logbook to record the happenings in each lesson carried out. This contained structured guide with open-ended questions to guide the teacher. The teachers were interviewed at the end of the lesson series and the learners responded to the student’s questionnaire. The Lesson observation guide was outlined as teacher expected actions in an investigative lesson set-up were the researcher recorded whether the expected action was observed or not. Teacher interview and logbook provided information regarding their perception on how the materials supported them in implementing learner centered investigative practical activities. They also provided the researcher with teachers’ perception on the effectiveness of the materials. Lesson observations provided data on practicality and effectiveness as observed by the researcher while questionnaire for students provided feedback from the learners. The average percentage of expected teacher actions observed during investigative practical work in each of the six chemistry practical lessons was calculated (Table 1).

Table 1: Observed Teacher Actions During Investigative Practical Work

	Lesson number						
Lesson Phase	1	2	3	4	5	6	Average %
Introduction	60.16	79.98	91.42	79.98	88.56	91.42	81.92
Development	71.22	86.30	86.32	85.04	78.80	78.80	81.08
Conclusion	63.36	74.28	93.32	84.26	89.98	76.66	79.75

From Table 1, it can be observed that an average of 81.92% of expected teacher actions were observed in the introduction phase of the lessons, 81.08% expected teacher actions were observed in the lesson development phase and 79.75% actions were observed in the conclusion stage. These high percentages were taken to be an indication that the materials were used as intended by the developer and were able to facilitate teaching of practical work.

From the logbook and the interviews, the teachers indicated that the objectives for all the lessons were achieved. This implies that the materials were effective in their classes and were able to offer support for the implementation of investigative practical work. Concerning congruence, the teachers indicated that the practice was very different from what they commonly used in class but also indicated that the investigations would be easier to carry out when supported by such materials. All the teachers indicated that they experienced a problem with learners adjusting to the practice of developing their own procedures while they were used to being provided with step-by-step procedures for all their practical activities. The teachers indicated that the method had high demand on resources but also agreed that the materials were available and all it required was change in teaching approach as well as innovativeness.

The responses from students also showed that most students (83.3%) perceived the structure of the practical activities as motivating and helpful to them in carrying out the investigations. The responses that agreed to the statement ‘doing practical work by setting our own procedures makes practical work easier and more satisfying’ were quite high (88.2%). A high percentage (90.7%) of the learners indicated that they enjoyed the activities. Students perceived the exemplary materials helpful to their learning and understanding (88.2%). They perceived that they were able to learn the concepts easily because the developing their own procedures made them think about what they were doing. These were indications that if chemistry teachers could be supported by appropriate instructional materials they can make practical work a ‘minds on’ investigative activity.

After the evaluation the materials were refined to produce a model of materials that would support teaches in implementing learner centered practical work. The materials were meant to guide the teacher in carrying out a practical activity that would engage the learners both mentally and physically. The model instructional materials can be considered as a sample lesson planning and implementation guide. The basic structure of the practical activity resembles the common outline of a practical lesson involving planning, introduction of the lesson, lesson development and conclusion. The model guides through sequencing of instructional activities, which starts with identification of content to be taught to a particular group of learners based on their learning level. The general process of learner centered investigative practical lessons used in the study can be summarized as shown in Figure 4. It serves as conceptual framework for organizing and sequencing a set of instructional activities to build meaningful student learning.

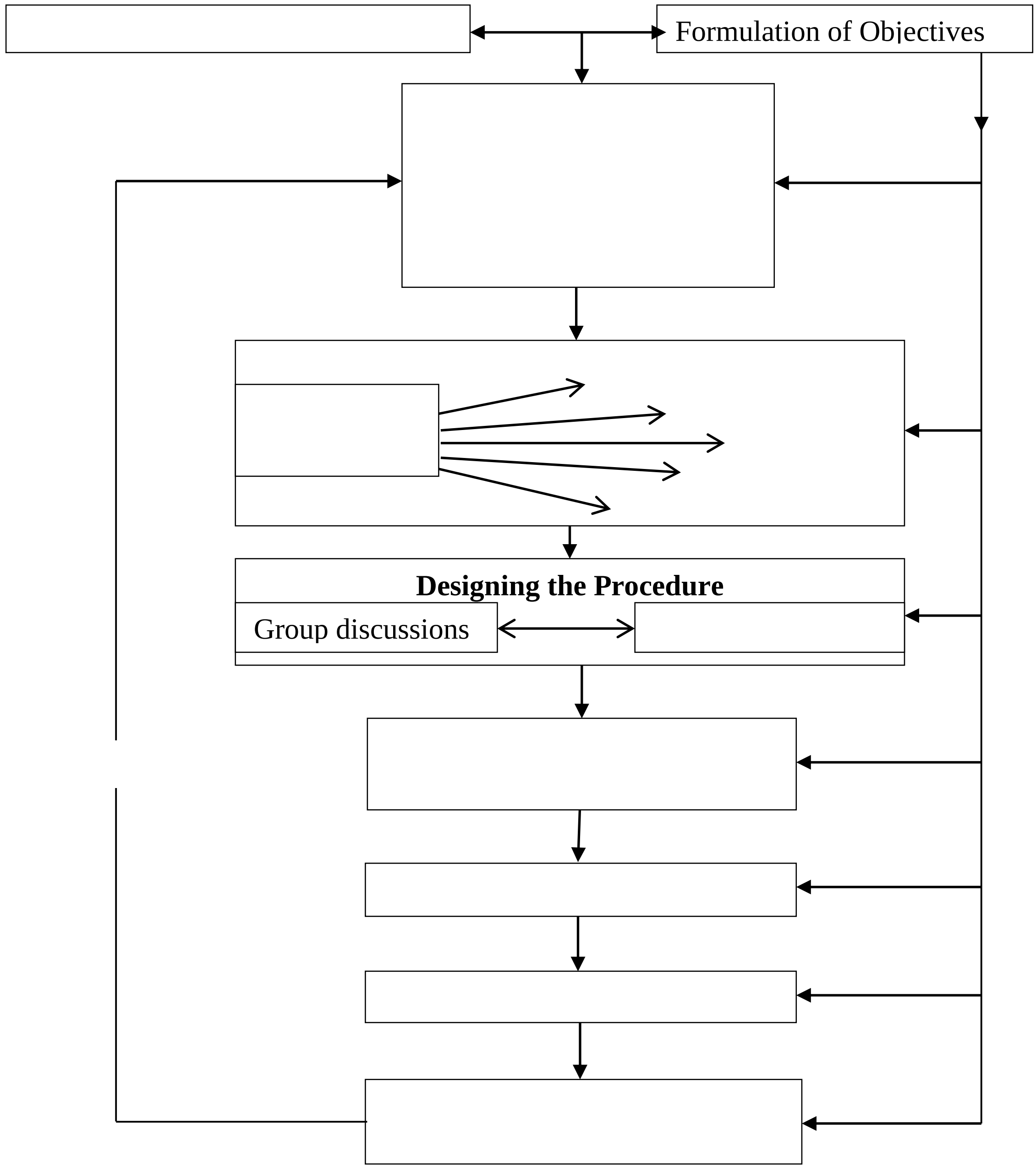


Figure 4: Model for Organizing and Sequencing Instructional Activities in Practical Work

Planning involves designing the activity, identification of required materials and safety precautions. The teacher guide provides detailed ideas on how to introduce the activity, which could be through a simple exercise, prediction, observation, examples or discussion. The discussion is tailored to assess relevant prior knowledge, identify preconceptions or misconceptions in science learning related to the particular activity. The teacher is guided to use open-ended driving question that would arouse learners' interest in the activity (Krajick et al., 2007). The lesson development section is broken further into sections of planning for the activity, plenary discussion of the procedures set and the carrying out of the actual activity. Learners are grouped in small groups of 2-4 learners and allowed to brainstorm on ways of carrying out an activity to achieve the objective set. They are provided with the apparatus or list of apparatus they will be using and allowed to plan for the investigation. Learners then develop their own experimental procedures. After the discussion of the procedures in groups, the learners are called to attention for plenary discussion with the teacher. The outcome of their discussions is presented and the teacher guides through the refinement of the procedures. The learners are allowed to carry out the practical activities using the procedures they have developed. They record their findings in their notebooks as they progress with the activity. Consolidation and discussion of results is done after the learners have carried out the activity. This involves pooling together their findings by receiving feedback from groups of learners. The teacher should then guide learners to make meaning in their discussion, and make conclusions related to the focus question or prediction, evidence and connection to the real world.

Conclusion

Teachers have a facilitative role in the learning using practical work in chemistry. They can change the commonly used procedures of teaching practical work into investigative activities involving: planning and designing practical activities, implementing their plans, carrying out analysis and interpretation of the results and applying the knowledge they acquired as a result of taking part in investigative practical work. It was deemed important to provide the teachers with instructional materials with sufficient details that support these activities. Instructional materials used in this study were a useful guide to the teachers in organizing learning resources, preparing students for the concept of the study, guiding students during their practical work activities and assisting learners in constructing meanings of the results of the activity. Most of the teachers were able to guide learners through development of the procedures using the teacher guide provided. This provided the lesson with the much-desired characteristic of being 'minds on' as well as 'hands on' activities. During the initial lessons, teachers felt that the approach was very demanding but with time they found the activities fulfilling.

References

Aksela, M. (2005). Supporting meaningful chemistry learning and higher-order thinking through computer-assisted inquiry: A Design Research Approach. Thesis, University of Helsinki; Finland. Retrieved from http://ethesis.helsinki.fi,/julkaisut/mat/kemia

Chiapetta, E.L. & Koballa, R.T. (2010). Science institution in the middle and secondary schools. Developing fundamental knowledge and skills. USA : Allyn and Bacon, Peason.

Davis, E. A., Arias, A. M., Bismack, A. S., Marulis, L. M., & Iwashyna, S. K. (2014). Designing Educative Curriculum Materials: A Theoretically and Empirically Driven Process. Harvard Educational Review, 84 (1), Spring.

DBRC. (2003). Design-Based Research Collective, Design-Based Research: An Emerging Paradigm for Educational Inquiry. Educational Researcher. 32. (1) 5–8.

Hubber, R.A. & Moore, C.J. (2001). A model for extending hands –on science to be inquiry based. School Science and Mathematics. 101 (1); 32-41.

Krajcik, J.S., McNeill, K. L., & Reiser, B.J. (2007). Learning-goals-driven design model: Developing curriculum materials that align with national standards and incorporate project-based pedagogy. Science Education, 92(1), 1-32. Retrieved from www.interscience.wiley.com

Kim, M., & Chin, C., (2011). Pre-service teachers' views on practical work with inquiry orientation in textbook-oriented science classrooms . International Journal of Environmental & Science Education, 6 (1), 23-37.

Motswiri, M. J. (2004). Supporting chemistry teachers in implementing formative assessment of investigative practical work in Botswana. Thesis. University of Twente, Enschede. Retrieved from

http://doc.utwente.nl/4824/1thesis-motswiri.pdf
National Academy of Sciences, (1997). Science for all children: a guide to improving elementary science education in your school district. Washington, DC: The National Academies Press. Retrieved from: http://www.nap.edu/openbook.php?record_id=4964&page=1
National Science Resources Center. (1997).“Criteria for Selecting Inquiry-Centered Science Curriculum Materials” (chapter 5). In Science for All Children: A Guide to Improving Elementary Science Education in Your School District (63-75). National Science Education Standards (NSES), Washington, DC: National Academy Press.
Nieveen, N. (1999). Prototyping to reach product quality. In J. van den Akker, R.M. Branch, K. Gustafson, N. Nieveen, & Plomp, T. (eds), Design approaches and tools in education and training (pp. 125-135). Dordrecht: Kluwer Academic Publishers.
Orado, G. (2009): Factors influencing performance in chemistry practical work among secondary schools in Nairobi Province. Unpublished M.Ed. Thesis, Kenyatta University, Kenya.
Ottevanger, W. (2013). Using design research to develop teacher support materials in order to facilitate the successful implementation of a new science curriculum in post-apartheid Namibia. In T. Plomp, & N. Nieveen (Eds.), Educational design research – Part B: Illustrative cases (pp. 381-405). Enschede, the Netherlands
Reiser, B. J., Krajcik, J., Moje E., & Marx, R. (2003). Design strategies for developing science instructional materials. Paper presented at the 2003 Annual Meeting of the National Association of Research in Science Teaching, Philadelphia, PA available at: http://www.umich.edu/~hiceweb/iqwst/Papers/reiser_krajcik_NARST03.pdf
SCORE. (2007). Practical work in science: a report and proposal for a strategic framework. London: The Science Community Representing Education, (SCORE). Retrieved from http://www.score-education.org/media/3668/report.currentissues.
Trowbridge, L.W., Bybee, R.W. & Janel, C.P. (2004). Teaching secondary school science, “Strategies for developing scientific literacy” New Jersey: Pearson, Ohio.
Twoli, N.W. (2006). Teaching secondary school chemistry. Nairobi: Neema Publishers, Kenya.
Wachanga, S.W., & Mwangi, J. G. (2004). Effects of Cooperative Class Experiment Teaching Method on Secondary School Students’ Chemistry Achievement in Kenya’s Nakuru District. International Educational Journal, 5(1), 26-36.
Yandila, C.D., Komane, S.S., & Moganane, S.V. (2003). Towards learner-centred approach in senior secondary school science lessons. Department of Mathematics and Science Education; University of Botswana.
Krajcik, J.S., Reiser, B. Moje, J E., & Marx, R. (2003). Design Strategies for Developing Science Instructional Materials. Paper presented at the 2003 Annual Meeting of the National Association of Research in Science Teaching. Philadelphia, PA. retrieved from: http://www.umich.edu/~hiceweb/iqwst/Papers/reiser_krajcik_NARST03.pdf

INSTRUCTIONAL MEDIA USE IN ENHANCING STUDENTS' LEARNING OF THE ENGLISH LANGUAGE IN BUNGOMA NORTH DISTRICT'S SECONDARY SCHOOLS IN BUNGOMA COUNTY, KENYA

Erastus Juma Wamalwa
Kenyatta University
werastus72j@yahoo.com

Simon Rukangu
Meru University of Science and Technology
rukangusimon@yahoo.com

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

This paper summarizes the findings of this qualitative research with regard to teachers of the English language using instructional media to enhance students' learning of English language in Bungoma North district. The study further sought to describe the availability, frequency use of instructional media in the secondary schools in Bungoma North District of Bungoma County and the relationship between the materials' use and learning. Based on John Sweller's Cognitive Load Theory, this study employed the descriptive survey design that sought to establish the instructional media type and their distribution in various secondary schools. The use of such results was used to establish the relationship between the instructional material and learning of English language. Questionnaires and checklist were used as the research instruments. The target population was the 30 secondary schools, 9505 students, 30 teachers and 30 library personnel. From this population a sample of 10 schools, 10 teachers and 10 library personnel were selected and used. The findings showed that not all schools had adequate Instructional Media; and that Instructional Media were not entirely used by teachers in teaching. Inferential results showed a positive relationship of r = 0.547 between Instructional material and enhancement of learning English; and r = 0.502 between use of Charts and students' learning of English language. Practical suggestions and recommendations to teachers of the English language, teachers' trainers as well as curriculum and material developers have been suggested. This is expected to address the perennial poor performance in English in Bungoma North district and generally, in Kenyan secondary schools.

Introduction and Background to the Study

The English language is one of the most widely spoken languages in the world taking the third position after Chinese and Spanish (Barbara, 2005). Due to its international status gained over time, it has gained the status of a world language (Llurda, 2004) it has become a global medium of inter-cultural communication of all the Commonwealth countries. In recognition of this status, English language is considered to be one of the two official languages as promulgated in the Constitution of Kenya 2010, Chapter 2 Article 7 Sub-article 2 with Kiswahili as the second official language in Kenya (Kenyan Constitution, 2010). The English language in particular is used in all forms of official communication, records and transactions. Specifically, it is used in all formal education institutions in Kenya, in government and private offices and parliament. It is therefore the medium of instruction in institutions of learning like schools, colleges and universities (KIE, 2002) amidst generally poor language use and KCSE results in the secondary schools and in Bungoma North district in particular. Any teaching strategy that would probably improve not only the international cultural interactions but also the pedagogic approaches in teaching and learning approaches among educational institutions in Bungoma North District; thus improving their performance in KCSE.

Since 2009, available records (Knec Reports: 2009-2013) show that Bungoma North district secondary schools have had their low KCSE English subject mean score kept fluctuating from 4.130 to 3.674 in 2010, and 3.549 in 2011. Such trend continued albeit some little improvement at 4.816 in 2012 but again dropped to 3.9718 in 2013 in the Kenya Certificate of Secondary Education (KCSE) national examinations in the English subject. The effects of such results vis-à-vis participative teaching approaches go beyond the district to international dynamics. This necessitated designing a systematic this study as a measure to identify issues that may have posed challenges in the teaching and learning of the English language subject in secondary schools using instructional media.

Statement of the Problem

Some key issues that affect the quality of education in teaching and learning of any subject, English language included are curriculum, instructional materials, equipment and teachers, among others (KNEC, 2004). The task of this study was therefore to find out the use of instructional media in teaching had a role in this poor performance. Thus, the main concern of this study was to investigate, identify, and describe the availability of instructional media and language teachers' use of these instructional media to provide information on the relationship between teaching and the use of instructional media for purposes of enhancing students' learning in Bungoma North district. The key research question is: Does the use of instructional media enhance learning?

Methodology

The descriptive survey design was used in this study. The key issues that were considered to be affecting learning and teaching and learning of English language subject in this district included curriculum, instructional materials, equipment and teachers, to collect data by use of questionnaire from students, teachers and library to provide the necessary description on the availability and use of Instructional Media because descriptive data are obtained through the use of questionnaires and observation method (Kothari, 2004).

The study was carried out in Bungoma North District in Bungoma County, Kenya and targeted 30 registered public secondary schools, 350 students, 10 teachers and 10 library personnel. A smaller representative sample of 10 schools; involving 10 teachers, 10 library personnel and 346 students were drawn.

Collected data was coded by assigning numbers to each questionnaire for identification purposes and then classified into categories. The coded data was then be entered into the Statistical Package for Social Sciences (SPSS) program where appropriate and analysed using qualitative techniques to reveal the sampled population's characteristics. The qualitative approach was employed to organize data from the open-ended questions in the questionnaire and checklist which were thematically categorized and subjected to analysis. The quantitative approach that involved the use of descriptive statistics was used to present data in frequencies, mean and percentages in order to determine characteristics of the availability and use of instructional media in enhancing the learning of their students.

Results and Discussion

Instructional media are important elements of teaching various subjects in the secondary schools especially for English language. This paper gives a summary of research findings and addresses students and teachers' use of Instructional Media and the availability of such materials in secondary schools in Bungoma North District. (Begin each argument for a research finding with the statement about a requirement of a specific objective).

Instructional Media Availability in Secondary Schools in Bungoma North District

The first objective of this research was to establish the availability of Instructional Media in secondary schools in Bungoma North District. The study sought to establish the different types of materials stored by their libraries or bookstores that yielded the findings as tabulated in Table 1. The table gives the statistics from a checklist on availability of the specific Instructional Media in secondary schools in Bungoma North District and the findings are discussed as follows. It was established from students that textbooks are the most available teaching and learning resource materials in schools at exceptionally commendable rates.

Computers, charts, photocopiers and the duplicating machine follow at fair rates respectively. The very essential materials like the projectors, record player and its accessories are the least available in the schools all at dismal. This reveals an imbalance of the availability of adequate variety of Instructional Media in schools.

The data presented in the table 1 reveals that of the available computers, only 3 quarters are in working condition while less than 2 thirds of the available T.V sets were in working condition. Only half of the available typewriters and slides and well over a third of cassette recorders, radios, textbooks, photocopiers and duplicating machines were in working condition. Just a quarter of the available computer projectors and an eighth of the record players, videotapes, pictures, charts, models, boards, tapes, cameras and handouts were in working condition. Effective delivery of content by use of every appropriate strategy and resource is of great concern and is worth laying emphasis on (Dick & Carey, 2001). However, teaching without using instructional media by reason of the media not being available may indeed negatively affect students' learning.

Schools with a Library

This study sought to ask students to indicate whether their schools had a library or bookstore. The findings are presented in the table 2. The findings in Table 2 indicate that well above 3 quarters of the students indicated that their school has a library or bookstore. Such facilities provide storage and security of the teaching and learning materials. They also give access and optimized conditions to students to use the materials for purposes of learning. Quite a dismal number of below an eighth showed that their schools do not have a library or bookstore. Such a situation probably makes it difficult for students in those schools to learn optimally. The lack of resources which conforms to views of Buhere (2001), Ryanga (2002) and Okwara (2012) restricts the choice of strategies on the teacher thus impacting negatively on teaching.

Such a situation probably makes it difficult for students in those schools to learn optimally. On the kind of materials available and stored by these libraries and bookstores, the study established that most schools stored textbooks as their most essential teaching material their libraries. The other types of materials were quite dismal for example film projectors and record players, radio cassettes, TV sets and video players. Nearly half had charts, photocopiers and duplicating machines and computers. Very few had models while none had slide projectors.

Instructional Media Use in Teaching the English Language

The second objective of this study sought to establish the Instructional Media that teachers of the English language use in teaching and their frequency of use.

Frequency of use of specific instructional media. Students were asked to indicate how frequent their teachers used given materials while teaching the English language in class. Results are presented in the Table 3. From Table 3, it was established that most teachers use printed materials while about a quarter use visual aids. Very few of them use audios and 3-dimension objects.

The above data show that printed material is the media used most in the Bungoma North District secondary schools. Printed media may include books, charts and handouts. Teachers find such material abundantly available because schools prioritize the purchase of such kind of materials over others. Most lesson content is bound in books and charts and as a result, such materials complement and supplement the teachers' practical presence in class. More types of the learning experiences as identified by some scholars (Twoli, et al, 2007) should be exposed to learners other than predominantly relying on books.

Instructional materials most frequently used. The study sought to identify the particular Instructional Materials most frequently used by teachers while teaching the English language. Results are shown in the Table 4. From the table, it was established that most teachers used printed materials while only about a quarter used visual aids. Very few of them use audios and 3-dimension objects. This shows a skewed in the selection of these teaching resources.

The results in Table 4 show that textbooks and black walls are the Instructional materials used most often by the teachers of the English language. Charts, handouts and radio cassettes are the instructional materials often used while pictures, the OHP, video and T.V are the materials less often used. On the other hand, films are rarely used while slides are not used at all. The over-reliance on textbooks and the black wall denies students the variety of experiences other options of materials would offer to make learning more exciting. Teachers should explore the use of other materials more (Allwright, 1990) to achieve enhanced learning by encouraging the students to engage with knowledge in different ways.

The study also revealed that majority of students stated that their teachers generally use Instructional Media while teaching the English language subject in class. However, on particular types of media, less than a sixth of the students indicated that their teachers use handouts and pictures. About a quarter of the students further indicated that their teachers of English use charts while teaching in class as the majority indicated that their teachers use the black wall. Almost none indicated that teachers use radio cassettes, the OHP and films. Students also indicated that teachers never use: video, TV or slides in teaching. Teachers need to give their students adequate experience with different teaching aids for varied experience and enhanced learning if they have to benefit more from the learning experience.

The study also found out that the frequency of use of Instructional media by their teachers was very often at a mean standard error of less than 1 for all materials. However the use varied depending on the type and availability of particular media. It was established that the use of Instructional Media by the English language teachers enhanced students' learning. Well over four fifths of the students felt that when their teachers of the English language use teaching resources, then their learning is enhanced because they would understand concepts better and this would essentially enhance their learning if indeed teachers practically used the resources.

Relationship between the Use of Instructional Media and Learning

The third objective of this study was to establish the relationship between the use of Instructional Media and learning of the English language. Results are as shown in the table 5. From the table it is seen that the use of text books positively influence the learning of English language at $p < .05$, and $r = 0.547$. Taking the coefficient of determinant, textbooks contributes 29.9 % variability in enhancement in the learning of English language. The use of handouts positively influence the leaning of English language at $p < .05$ and $r = 0.318$. Taking coefficient of determinant, handouts contributes 10.1% variability in the enhancement of English language. Charts as an instructional media positively influenced the learning of English language at $p < .05$ and $r = 0.459$ (equation (2)). Taking coefficient of determinant to be r, the charts contribute 21 % variability in the enhancement of English language. Black wall and radio too influences the learning of English positively at $P < .05$ and $r =.502$ and .389. Taking the coefficient of determinant black wall and radio contributes 25.2 % and 15.1 % variability in the enhancement of English language.

Students were required to state their experiences with regard to their teacher's use of instructional media in class. The study established therefore that most students experienced enhanced learning if teachers used teaching instructional resources. The study further established that resources make over half of the students to understand concepts better and hence perform well.

This study further confirmed the positive effect of enhanced learning that the use of resources makes on students' learning as also established by Kimui, (1990) as over half of the students felt Instructional materials make them to understand the English language and to perform well. This therefore underscores the role Instructional Media play in enhancing learning hence teachers have to embrace the use of Instructional media in teaching if their students' learning has to be enhanced.

The study therefore showed that overall, instructional material have a positive influence in the learning of English language at 22% in variability of enhancing learning of English language. Other factors not addressed by this study may provide additional positive influence to learning.

Equations

1. (r = 0.547, n = ?, p = 0.010) (See Table 4.46 pg. 84). (Indicate sample size n as indicated here below)
2. (r = 0.459, n = ?, at p = 0.05)"(See relevant tables and figures for useful cross referencing)
3. (r = 0.502, n = :, at p = 0.001)"

Tables

Table 1: Specific Instructional material available and in working condition

Instruction material	Frequency	Percentage
Opaque projector	0	0
Overhead projector	0	0
Slide projector	0	0
Film projector	0	0
Record player	4	12.5
Cassette recorder	11	37.5
video tape	4	12.5
Pictures	4	12.5
Charts	4	12.5
Models	4	12.5
Boards	4	12.5
Tapes	4	12.5
Slides	15	50
Cameras	4	12.5
Radios	11	37.5
TV	19	62.5
Text books	11	37.5
Handouts	4	12.5
Photocopy machine	11	37.5

Duplicating machines	11	37.5
Type writers	15	50
Computers	23	75
Computer projector	8	25

Table 2: Schools with library or store

Library or store	Frequency	Percentage
Yes	296	85.6
No	18	5.2
Missing	32	9.3
Total	346	100.0

Table 3: Students' response on how often their teachers use specific materials

Instructional media	N	Mean		Std. Deviation	Skewness	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
Text books	346	1.3229	.06369	.62399	2.298	.246
Handouts	346	2.4706	.21209	.87447	2.008	.550
Pictures	346	2.7500	.30464	1.05529	-.522	.637
Charts	346	2.2963	.19839	1.03086	.938	.448
Black wall	346	1.3864	.08768	.82255	2.213	.257
Radio cassettes	346	2.4000	.74833	1.67332	1.089	.913
Over Head projector	346	3.2000	.66332	1.48324	-.552	.913
Video and TV	346	3.5000	1.5000	2.12132	.	.
Slides	346	5.0000	.	.	.	.
Films	346	4.0000	1.0000	1.41421	.	.

Key: 1- very often, 2-often, 3- less often, 4- rarely, 5- None at all

Table 4: Instructional Materials Most Frequently Used in Teaching English in Schools

Instruction material	Frequency	Percentage
Visual aids	6	20
Audios	3	10
Printed materials	27	90
3Ds objects	3	10

Table 5: Relationship between Instruction Material and Learning of English

Correlation			Enhancement of English language.
Spearman's rho	Use the text books	Correlation Coefficient	.547*
		Sig. (1-tailed)	.010
		N	376
	Use the handouts	Correlation Coefficient	.318
		Sig. (1-tailed)	.007
		N	376
	Use the charts	Correlation Coefficient	.459
		Sig. (1-tailed)	.05
		N	376
	Use the black wall	Correlation Coefficient	.502
		Sig. (1-tailed)	.001
		N	376
	Use the radio.	Correlation Coefficient	.389
		Sig. (1-tailed)	.048
		N	376

Conclusions

The main objective of this study was to investigate the utilization of Instructional Media in enhancing students' learning of the English language. The study was anchored on the Cognitive Load theory by John Sweller (2005). It had a keen interest on: identifying the Instructional resources available in schools for teaching the English language, finding out the frequency to which teachers use Instructional Media while teaching their students and the relationship between the use of Instructional media and learning the English language. The study was important because KCSE performance of Bungoma North district in the English subject has remained below average over the years according to the KNEC reports.

(NB: Each conclusion and recommendation must arise from a finding. Do it that way).

Based on the findings on availability of Instructional Media, it was established students that text books are the most available teaching and learning resource in schools at exceptionally commendable rates. Computers, charts, photocopiers and the duplicating machine follow at fair rates respectively. The very essential materials like the projectors, record player and its accessories are the least available in the schools all at dismal

On the adequacy of the learning materials, the study established that apart from textbooks other materials like computers and other print machines and the rest of the very essential materials are not adequate like the handouts, pictures models and cameras.

On frequency of use, the study established that generally, students often use the available materials in the library especially printed material like books and charts at a descriptive statistic mean of 1.6804, however visual aids, audios and 3D objects were least used.

On the relationship between use of Instructional Media and learning, the study established most students experienced enhanced learning if teachers used teaching resources. The study further established that resources motivate and make learners to understand concepts better, perform well, and improve their reading, writing and listening skills. Instructional Media also improve their attention and helpful in research and exercises.

The study therefore shows that instruction material in overall have a positive influence in the learning of English language at 22% in variability of enhancing learning of English language.

From the above findings, this study disputes Richard E. Clark (2008)'s claims that Media not only fail to influence learning but that also do not directly motivate learning. From the teachers furthermore, the study further established that if resources are available and effectively used, they motivate learners disapproving Clark's claims.

Recommendations

From the conclusions regarding English language teachers' use of Instructional Media in enhancing their students' learning, the following recommendations need to be considered by the English language teachers, teacher trainers, teacher trainees, language scholars and other education stakeholders.

Regular English language teaching workshops need to be organized by the ministry of Education for teachers to equip them with skills of coping with the demands of language teaching particularly in the use of Instructional Media. Teachers should be encouraged by their supervisors to make more use of other types of materials besides textbooks. Internal school inspection mechanisms should be established to ensure that these important materials are integrated in teaching.

Schools should also endeavour to replace the obsolete equipment with more technologically modern equipment. Preparation and use of instructional materials by English language teachers need to be encouraged through the syllabus and teachers' guides. Suggestions on appropriate instructional materials are missing in the current syllabus and KIE approved class texts. To make this possible, the ministry of Education should provide guidance on procurement of other Instructional Media besides books.

English language teachers should advise their schools on the need of purchasing and availing more and diversified types of Instructional Media. School managers need to purchase diversified English language readers for learners. This will enhance reading that will promote writing as suggested by Awino (2011) and Buhere (2001). English lessons need to have an hour where given prescribed media will be used in teaching. The additional lesson should be a double lesson to give more time to allow media set-up and operation.

The teachers should creatively select their materials from a variety of available resources. Efforts should be made to prepare resources that can be used over a period of time. There should be newspapers in the English language which learners should be encouraged to read to enhance their learning of the English language. Cartoons and other pictures could be used to develop various story lines on issues that affect learners and this would bring variety in media and hence enhance learning.

References

Allwright, R. L. (1990). *What do we want teaching materials for*? In R. Rossner and Bolitho, (Eds.), Currents in language teaching. Oxford University Press.

Awino, O. E. (2011). Instructional methods for composition writing in French at secondary school Level in Nairobi, Kenya. Nairobi: Unpublished Master's Thesis), Kenyatta University.

Ayot, H.O, and Patel, M.M. (1987). *Instructional Methods*. Nairobi: Kenyatta University.

Barbara, F. G. (2005). Ethnologue, 13th Ed. Summer Institute of Linguistics, Inc.

Buhere K. (2013 August 27) To teach in high school, graduates must resit K.C.S.E. *The Standard* p. 21.

Clark, R. E. (2008) *Media will Never Influence Learning: www.usq.edu.au/.../resource/clark/media.*

Dick, W. and Carey, J.O. (2001).*The Systematic Design of Instruction*. New York: Longman Publishers.

Kenyan Constitution, (2010)

Kimui, W. (1990).A study of availability and use of learning and teaching resources in PTCs in Kenya. Nairobi: Unpublished PhD Thesis. Kenyatta University.

Okwara, M.O.(2012) A study of factors related to achievement in written composition among secondary school students in Busia District. Nairobi: Unpublished masters' thesis, Kenyatta University.

Twoli,N. et.al (2007). *Instructional Methods in Education.* Nairobi: KIE.

Ryanga, C.W.A. (2002) Reading and writing: The connection to personal, social and economic development. *International Journal of the school of humanities and social sciences. 2* (1) 106-119.Retrived from Waveney Olembo (ed) Chemchemi.

Sweller, J. (2005). *Implications of Cognitive Load Theory for Multimedia Learning (Ed).* New York: Cambridge University Press.

DO PICTURES HAVE AN EFFECT ON LEARNER PERFORMANCE IN COMPOSITION WRITING?

P. Kalemesi Jumba
Kenyatta University

F. Etyang
Kenyatta University

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Instruction using a variety of learning resources has been heralded as a most promising activity that can engage students into academic language and literacy skills. There are few studies investigating approaches in teaching English composition in primary school. Furthermore emphasis on learner foundations in writing is lacking in most African countries. The purpose behind this review is to establish whether using pictures could reinforce composition writing in upper primary schools. There is scanty research on picture-based instruction in general and on its effect on composition writing and language achievement in particular. The objective of this review is to examine the effectiveness of using pictures on learner performance in composition writing. Preliminary studies have established that pictures have an increasing effect on both composition writing and general attitude of learners towards English. On the basis of the findings of the study, the following conclusions were made: Most teachers do not use pictures to teach composition since it is time wasting because it requires a lot of time in preparation and acquisition of pictures. However, from various studies, when learners were exposed to pictures during composition writing lessons and eventually in examinations, their performance was significantly better than before. It is imperative that, a study be carried out on role played by the school administration and the community in the effective teaching of English and also, the relevance of the English language curriculum used at teacher training colleges in relation to the new trends in English Composition. Furthermore it would be necessary to evaluate the efficiency and effectiveness of Ministry of Education in English language assessment by Quality Assurance and Standards Officers.

Key words: Pictures, Motivation, Composition Writing

Background

Kenya has an education system commonly known as the 8-4-4 system. The system comprises of 8 years of primary education, 4 years of secondary education and a minimum of 4 years of university education. Progression from primary to secondary school and from secondary to university is through selection on the basis of performance in the national examinations for the Kenya Certificate of Primary Education (KCPE) and the Kenya Certificate of Secondary Education (KCSE), which are tested in English, apart from the Swahili examinations that is tested in Swahili. The selective manner of progression between levels is a clear indication that not all students who complete the primary course have the opportunity to pursue further education. For instance, according to the Ministry of Education's (1999) statistics, only an average of 45% of the primary school pupils who take the KCPE examination are selected for entry into high school. Among the students who are not selected for high school entry, some join village polytechnics, repeat or drop out of school. Poor KCPE examinations scores at the end of Standard 8 also create a barrier in accessing Secondary School. 2004 KCPE results show that a much higher percentage of students from private schools qualify for secondary school than public school, which has led to an overrepresentation of private school graduates attending top Kenyan Secondary Schools (Glennerster & Kremer, 2011)

The early development of language enables a child to develop effective and orderly reasoning that is important in composition writing (Adoyo, 2008). In 2001, Jim Ackers and Frank Hardman conducted a study on classroom interactions in primary schools in Kenya and found that the predominant teaching style was characterized by the 'transmission of knowledge' and was teacher centered in nature. Acker and Hardman point out those impediments to learning also include a lack of teaching resources and poor physical conditions of classroom spaces. However prevalent classroom interaction in most classrooms in many parts of the world including Kenya (Acker & Hardman, 2001; Pontefract & Hardman, 2005) is the teacher- student interaction pattern, commonly known as IRE (Initiate – Respond – Evaluate) discourse pattern, Lisanza (2011) Evidence shows that students in public primary schools are achieving significantly lower than their private school counterparts. There are a number of factors that can account for this disparity, which directly relate to the quality of primary education and the interactions between teacher and pupil.

Despite the significant role played by writing in the school curriculum, studies point out that secondary school students lack basic skills of writing. Studies in Australia have shown that there is low quality of writing in middle and upper primary schools, which has led to on-going problems in the secondary years (Ferris, & Hedgcock, 2013). The study suggested that teacher knowledge is critical in enabling educators to provide support for students to further develop their writing after the initial years of school. (Zeichner & Liston, 1987, Borkho, 2004)

Performance in writing continues to be unsatisfactory as evidenced by school leavers' lack of communicative competence. Luchters et al. (2008) assert that universities have voiced concern about "fresher's, who are unable to speak, read, write or hold discussions in English". KNEC Report (2002) shows that students are weak in both mechanical and stylistic skills of writing. They are also weak at punctuation, word choice and make frequent construction errors. This therefore made it necessary to probe the challenges in teaching and learning of composition writing in primary schools.

Teaching language as an activity is important especially where learners lack the expected writing proficiency. In Kenya, it has been observed that many upper primary learners at class eight, especially those from public schools, do not have the required writing proficiency. This could be because of several factors such; as inadequate writing practice in the classroom, poor vocabulary, examination oriented writing, and teacher dictated writing, lack of exposure to English, lack of a homogenous English speaking community, limited reading habits and so on. Andiema (2014) investigated the use of process approach in teaching writing skills and observed that most teachers find it difficult to teach writing. They used poor approaches and majority lectured students on how to write.

A study by Coxhead and Pat (2007) suggests three main teaching methods that can be used in teaching English composition writing and the activities involved. These were; shared teaching and learning which involves exchanging of letters, sharing journals; cooperative teaching and learning which involves, keeping a class journal, making a class magazine, working together on a project, sharing cultural information and reading together; finally role play which Hedge says involves news casting and peer teaching. Other strategies suggested as effective in teaching and learning English composition writing are shared reading and scaffolding writing (Troia & Graham, 2012; Hedge, 2001). However the resources used may not be at the disposal of teachers in the public primary schools in Kenya hence there is need to diversify. Use of pictures in composition writing is being researched on in this study as an alternative to the methods so far suggested in order to give teachers a variety to pick from.

The learning of English for about six to eight years and still being unable to write a paragraph correctly and coherently calls for an investigation. It has been noticed that a large percentage of failures from primary schools in KCPE examination occurs especially due to poor performance in English.

Poor performance in composition writing does not only affect the performance in English of these learners in KCPE examination, but also affects their career and further education; therefore, there is an extreme need to help these learners improve their academic writing skill in English language. Use of pictures in English language instruction is one of the many strategies that may be used to reinforce teaching of English composition at elementary level. This study will shed more light on how effective this resource may be in developing better composition writing skills. It is against this backdrop that the current study set out to determine the effectiveness of using pictures in teaching and learning of composition writing in primary schools in order to provide ways forward in improving the writing skills among learners.

Performance in Public and Private Schools

Performance in private schools is much better than that of public schools. This may be due to several factors: One being that English is the common language of transacting business in private schools, unlike in public schools where mother tongue and Kiswahili are the languages of communication, especially outside the classroom. Some private schools are better resourced in terms of finances and materials, including other motivational school facilities. Class sizes in most private schools are mostly much smaller than in public schools where classrooms are congested. Learners in private schools can therefore be given individual attention when need arises, which is not the case in public schools. In most private schools too, there is enough space to practice various teaching techniques like group discussion that promote language learning. It is impossible to use such teaching techniques in congested classrooms like those found in public schools (Gathumbi, 2013).

Writing of Composition

Like speaking, writing is a productive skill. It involves producing language rather than receiving it. Writing involves communicating a message. In order to write, we need to form letters and words, join these together to make words, sentences or a series of sentences that link together to communicate a message. Learning to write in a second language is not merely learning to put down on paper the conventional symbols of the writing system that represents the utterances one has in mind, but it is also purposeful selection and organization of ideas, facts and experiences. In other words, writing is a thinking process and is much more than just copying. Writing aims at compactness and precision in expression as well as grammatical, idiomatic and orthographic accuracy. Therefore, learning to write involves learning to use grammar with ease and present facts in a sequential order. Writing is required to communicate with other people, to understand them, talk to them, read what others have written and to write to them. The sub skills of writing are planning, forming letters, punctuating correctly, linking, using the appropriate layout, paragraphing and so on.

Composition writing is one of the fundamental skills imparted into the pupil at the elementary level as a preparation for future proficiency in writing at higher levels in academia. If pictures can be instrumental in reinforcing the skills of writing, then this may go a long way in increasing such proficiency.

Conventional Methods of Teaching Composition Writing

According to Gathumbi and Masembe (2005), there are many strategies a teacher can choose from in teaching English composition writing namely; field trips, hands on activities, songs, project work, group work, and pair work, story-telling, discussions, poems, debates and presentation. Traditional method used in English composition writing is the write-correct-rewrite method that is still used by a number of teachers of composition writing teachers of today. In this teaching model, the teacher ordinarily either assigns or suggests a topic that the pupils are to write about. The pupils would then write a rough draft that the teacher would correct. The manner of checking the rough drafts varies from teacher to teacher as some teachers still simply mark the pupils' works with the symbols for correction while others make an outright correction on the draft. As soon as these rough drafts are checked, they are returned to the pupils so that it can be rewritten and resubmitted to the teachers for final grading. The problem with this kind of model for teaching English writing is that some of the topics that are suggested or assigned to the students may be topics that are unfamiliar or even foreign to the pupils. An alternative model of teaching writing should then be implemented.

Another method of teaching English composition is through the use of the Oral Discourse Based Method. This method of class composition writing emphasizes on the relationships among the stimulus, the problem, the oral discussion and the final written composition (Hillocks, 1986). It is a teaching model that can take place at any grade level that is involved in English writing. Using this method of teaching composition writing follows a schematic that would involve six major box flows namely: stimulus maybe composed of living experience, picture, student narrative, literature, current news, or an actual object. The stimulus is the most urgent need of the students for any written or oral composition. It serves mainly to activate the flow of the discourse at the grade school or at higher levels of education.

Use of Pictures in Language Teaching

As Hill (1990) pointed out, “the standard classroom” is usually not a very suitable environment for learning languages. That is why teachers search for various aids and stimuli to improve this situation. Pictures are one of these valuable aids. They bring “images of reality into the unnatural world of the language classroom.” (Hill, 1990) Pictures bring not only images of reality, but can also function as a fun element in the class. Sometimes it is surprising, how pictures may change a lesson, even if only employed in additional exercises or just to create the atmosphere.

Pictures meet with a wide range of use not only in acquiring vocabulary, but also in many other aspects of foreign language teaching. Wright (1990) demonstrated this fact on an example, where he used one compiled picture and illustrated the possibility of use in five very different language areas. His example shows employing pictures in teaching structure, vocabulary, functions, situations and all the four skills.

Hillocks (1992) has demonstrated several advantages of pictures, such as availability (one can get them in any magazines, on the internet, etc.); they are cheap, often free; they are personal (teacher selects them); flexibility - easily kept, useful for various types of activities (drilling, comparing, etc.), they are “always fresh and different”, which means they come in a variety of formats and styles and moreover the learner often wonders what comes next. (Hill 1990)

Strategic use of images in the classroom helps engage students who have grown up in a media-rich environment. Digital technology makes images more readily available and easier to incorporate into teaching and learning materials. While teaching with images has been at the core of disciplines like art history for decades, all courses can benefit from the use of visual materials in class lectures, assignments, exercises, and resources. Images can be an effective way of presenting abstract concepts or groups of data. Instructors have reported that their use of images in the classroom has led to increased student interactivity and discussion. Using pictures is one of the teaching aids that teachers depend on in their teaching. Harmer (2001) states that, “Teachers have always used pictures or graphics – whether drawn, taken from books, newspapers and magazines, or photographs – to facilitate learning”. They also feel that pictures attract pupils’ attention and deepen their understanding of vocabulary. Pictures can also help learners with abstract words, and associating the words with a concrete object makes these words easier to remember. Harmer (2001) states, “one of the most appropriate uses for pictures is for the presenting and checking of meaning. An easy way of explaining the meaning of the word aeroplane, for example, is to have a picture of one." Of course, not all new words can be taught using pictures but most concrete vocabulary can. Some of these techniques involve the use of pictures from a variety of sources - pictures from computers; photographs; drawings or diagrams on the board; and pictures from books. It will be interesting in this study to see which techniques teachers use.

According to Harmer (2001), pictures should be appropriate not only for the language to be learned but also for the classes they are being used for; if pictures are too childish students may not like them and if they are culturally inappropriate they can offend people. Pictures also need to be visible – especially if they are being shown to the whole class; they need to be big enough for everyone to see. And it also helps if pictures are durable – that is, strong enough to be used several times.

Types of Pictures

Wall pictures and posters, compiled pictures. Wall-pictures are a valuable visual material for language classes. In the first place, they can be displayed in the classroom to set English (or foreign in general) environment and then they function as another source of language to be absorbed by students in the process of natural acquisition. Furthermore, they will find their use both in presentation of new language and controlled practice. (Marzuki, 2015) specified in their characteristics of wall-pictures that these are often complex pictures, illustrating a scene and containing lots of objects and details. They are big enough to be seen by the whole class and they can be used instantly and repeatedly.

Due to their character, they are obviously suitable for presentation of new language. They put vocabulary into context and therefore make the presentation meaningful, which is highly recommended for successful retention of new words.

Compiled pictures may also be found in plenty variations of worksheets. They are useful for individual written exercises on structure as well as vocabulary practice and for speaking activities in pair work. These often occur in the form of handouts with two slightly differing pictures (or a picture and text), which are used in individual work or pair work. Alternatively, different details can be missing in each picture, which can lead to information-gap type of activity for pair work. Activities with compiled pictures are usually popular among students, giving them an opportunity to apply their knowledge of vocabulary and structure in combination with their ability to speak in order to reach the goal.

Pictures are used in composition writing to arouse interest and draw the learner's attention to the subject at hand; they stimulate interest and make the learner innovative in the sense of developing stories around the pictures at hand.

Embossed pictures. Embossed pictures are sometimes referred to as raised letters (tactile dots). The embossed pictures exist in a form that can be touched, felt, and seen easily by the pupils. To make embossed letters, words, sentences, and pictures, the researcher use the following materials: coloured thread, manila papers, pair of scissors, glue, pencil, felt pens and stencils. This kind of pictures can be useful when teaching writing composition to the hearing impaired learners.

Composition Writing Using Pictures

A creative teacher always trains a learner to master a lesson he has given, especially in writing. The teacher is a motivator who helps the students to write idea and point of view through writing. Primary learners prefer playing to studying. So this research is about teaching writing composition using pictures. Pictures can make learners express their ideas and understand more the material given by a teacher. Pictures stimulate learners to discuss the topic hence come up with a good story to write. These activities make learners more active in learning the process of writing and at the same time make learning more meaningful and fun for them. Learners will understand better the material and it will be easier to make a new idea by using pictures because they do not only listen to the material but also see it.

A study has suggested that there is a significant difference between use of pictures and other visual aids in teaching of vocabulary among Iranian beginners (Gutierrez et al., 2015) there may be likelihood that when used in the same language teaching but for writing it would have an impact. Furthermore pictures have been shown to draw students' attention more during the lesson hence possibly they would make the lesson more interesting. This then drives my interest in comparative study on use of pictures and the usual conventional teaching that is banal. That is what this study seeks to establish, whether the same pictures can be used to generate some positive results or otherwise in the writing of composition

Motivation in Learning English

Motivation is the driving force that helps us to achieve goals. Motivation is said to be intrinsic or extrinsic. According to various theories, motivation may be rooted in a basic need to minimize physical pain and maximize pleasure, or it may include specific needs such as eating and resting, or a desired object, goal, state of being, ideal, or it may be attributed to less-apparent reasons such as altruism, selfishness, morality, or avoiding mortality. This research is also exploring the effectiveness of a picture in as far as motivating learners to write good composition full of creativity and imagination.

Pictures help pupils to be inspired to have more creative ideas. They are used as additional tools to motivate students to develop their vocabulary hence express their ideas. By having many vocabularies, pupils can be guided to expand their sentences. Through pictures, pupils have more flexibility and freedom to write well developed story so that they can share with others. Picture series are excellent devices in providing both in purpose and content for writing activity. By using picture series, it is hoped that the students will increase their motivation in the teaching and learning process. Of course, there are many other techniques, methods or approaches, yet it needs priority. As people say, "a picture is worth a thousand words".

Summary

From preliminary findings of our ongoing study, it has been shown that very few teachers use pictures when teaching composition writing. When asked to explain why they preferred other methods to the use of pictures, the teachers noted that they hardly had time and resources to facilitate the acquisition of pictures. This shows that pictures are one of the motivators to good composition writing. These findings are in agreement with those in the US by Steve Graham showing that, students are also likely to be more motivated to write if you are enthusiastic about writing. Furthermore this is in agreement with a study on use of picture series in Java (Ariningsih, 2010) where use of picture series was compared with translation in writing instruction. The results showed a significant difference between the two approaches, reinforcing the fact that pictures are a strong tool to motivate learners. All these findings are a pointer to the fact that more innovation in teaching of the English composition is imperative in order that we may realize better performance in elementary levels of instruction.

What is of more concern is the fact that very few studies have been conducted in Africa on the use of pictures in teaching of English. There is need for more pragmatism in the education sector to purposefully consider studies on this aspect of instruction

In Kenya, there few studies that have been carried out to evaluate the use of pictures in teaching English composition in primary schools. It would be interesting to know the effect of this valuable resource on performance, considering that, from past studies on performance, composition writing has been lowly performed hence impacting negatively on the general performance of English language.

As noted above, although it is generally accepted that pictures can play an important role in drawing the attention of the learner and getting the learner involved in classroom activities, there is need to go further to examine the effectiveness of these pictures in motivating the learner to write better compositions.

We recommend that a study be carried out on the role played by the school administration and the community in the effective teaching of English composition and the relevance of the English language curriculum used at teacher training colleges in relation to the new trends in English Composition. Furthermore it would be necessary to evaluate the efficiency and effectiveness of Ministry of Education in English language assessment by Quality Assurance and Standards Officers.

References

Ackers, J., & Hardman, F. (2001). Classroom interaction in Kenyan primary schools. *Compare*, *31*(2), 245-261.

Adoyo, P. O. (2008). Educating Deaf Children in an Inclusive setting in Kenya: Challenges and Considerations. *Nairobi: University of Kenya*.

Aldridge, J., & Fraser, B. (2000). A cross-cultural study of classroom learning environments in Australia

Andiema, N., & M'mbone, J. (2014). Challenges in Teaching Composition Writing In Secondary Schools in Pokot County, Kenya. *Journal of Education and Practice*, *5*(1), 132-138.

Ariningsih, D. (2010). *The effectiveness of using picture series to improve the students'writing skill viewed from their learning motivation (An Experimental Study in the Seventh Grade of SMPN 1 Tanjunganom Nganjuk in the Academic Year 2008/2009)* (Doctoral dissertation, Universitas Sebelas Maret).

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational researcher*, *33*(8), 3-15.

Coxhead, A., & Byrd, P. (2007). Preparing writing teachers to teach the vocabulary and grammar of academic prose. *Journal of Second Language Writing*, *16*(3), 129-147.

Ferris, D. R., & Hedgcock, J. (2013). *Teaching ESL composition: Purpose, process, and practice*. Routledge.

Gathumbi, A. W., Mungai, N. J., & Hintze, D. L. (2013). Towards comprehensive professional development of teachers: The Case of Kenya.*International Journal of Process Education*, *5*(1), 3-14.

Graham, S., & Perin, D. (2007). Writing next: Effective strategies to improve writing of adolescents in middle and high schools—A report to the Carnegie Corporation of New York.Washington, DC: Alliance for Excellence in Education.

Graham, S., McKeown, D., Kiuhara, S., & Harris, K. R. (2012). A meta-analysis of writing instruction for students in the elementary grades. *Journal of Educational Psychology*, *104*(4), 879.

Gutierrez, K. G. C., Puello, M. N., & Galvis, L. A. P. (2015). Using Pictures Series Technique to Enhance Narrative Writing among Ninth Grade Students at Institucion Educativa Simon Araujo. *English Language Teaching*, *8*(5), p45.

Hedge, T. (2001). *Teaching and learning in the language classroom* (Vol. 106). Oxford,, UK: Oxford University Press.

Hillocks Jr, G. (1986). *Research on written composition: New directions for teaching*. National Council of Teachers of English, 1111 Kenyon Rd., Urbana, IL 61801

Kremer, M., Brannen, C., & Glennerster, R. (2013). The challenge of education and learning in the developing world. *Science*, *340*(6130), 297-300.

Lisanza, E. M. (2011). *What does it mean to learn oral and written English language: a case study of a rural Kenyan classroom* (Doctoral dissertation, University of Illinois at Urbana-Champaig)

Luchters, S., Chersich, M. F., Rinyiru, A., Barasa, M. S., King'ola, N., Mandaliya, K., ... & Temmerman, M. (2008). Impact of five years of peer-mediated interventions on sexual behavior and sexually transmitted infections among female sex workers in Mombasa, Kenya. *BMC public health*, *8*(1), 143.

Marzuki, H. (2015). Improving students vocabulary mastery by using pictures media at the third grade of sdn 010 kepenuhan. *Jurnal Ilmiah Mahasiswa FKIP Prodi Bahasa Inggris*, *1*(1).

Ogalo, M. O., & Gathumbi, A. W. (2011). An investigation of utilization of teaching techniques that enhance integration of the four basic english language skills in secondary schools in kenya. *Quality Education for Societal Transformation Nairobi, Kenya July 20-22, 2011*, *20*, 702.

Pontefract, C., & Hardman, F. (2005). The discourse of classroom interaction in Kenyan primary schools. *Comparative education*, *41*(1), 87-106.

Zeichner, K. M., & Liston, D. P. (1987). Teaching student teachers to reflect. *Harvard educational review*, *57*(1), 23-49.

THE PREVAILING STATE OF TEACHING PRACTICE IN TEACHER PREPARATION

Penina Kamina
SUNY Oneonta
peninao@yahoo.com

Moses K. Ochanji
California State University, San Marcos
mochanji@csusm.edu

Henry O. Ayot
Kenyatta University
hoayotk@yahoo.com

Samson R. Ondigi
Kenyatta University
Ondigi@yahoo.com

This study on teaching practice experience was conducted at a Kenyan University by researchers from both the USA and Kenya, a partnership project, to build capacity through quality teacher preparation. The portion of study presented here used survey techniques and specifically addressed the student teachers' perspectives on the preparation processes, and ability to plan, instruct and use feedback to improve instruction in teaching practice. Stratified sampling of student teachers (n=360) and supervisor (n=240) was used. The student teacher questionnaire covered several educational components such as professionalism, lesson material preparation, content knowledge, teaching performance skills, and reflection based on classroom observation feedback. The major findings were student teachers inability to integrate Information Communication Technology (ICT) in teaching and lack of supportive supervisory feedback.
The study recommends mapping teacher education courses to ensure that ICT and expert feedback are covered before going for teaching practice, by offering coursework on modern accessible ICT, and by facilitating rigorous microteaching experiences. Additionally, train enough supervisors to observe student teachers during teaching practice, put careful consideration in school placements and coordinate posting of student teachers in a timely manner.

Introduction

In teacher preparation, educational accrediting bodies identify specific standards by which teacher performance is evaluated (Ministry of Education, 2013; Council for the Accreditation of Educator Preparation [CAEP], 2013). In Kenya these standards are part of the quality assurance (http://www.education.go.ke). One of the required accrediting standard is for the student teacher to intern or practice.

Internship is an important component of any professional training since it provides the opportunity to translate theory into practice (Glickman & Bey, 1990; Mclntyre, Byrd, & Fox, 1996). In teacher preparation, the internship is normally in form of student teaching or teaching practice (TP) as it is referred to in Kenya. During TP, the student teacher is obligated to prepare and teach lessons in a classroom setting. At this time, the student teacher is observed and given feedback on lesson planning and teaching by a supervisor. The student teacher's performance is assessed on various skills such as the ability to:

1. Plan instruction based upon knowledge of subject matter, learners, and curriculum goals.
2. Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
3. Provide learning opportunities that support learners' intellectual, social, and personal development.
4. Create instructional opportunities that are adapted to diverse learners.
5. Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.
6. Integrate Information Communication Technology (ICT) in teaching and learning.
7. Create learning experiences that make the subject matter meaningful to learners.

8. Use a variety of instructional strategies to encourage learners' development of critical thinking, problem solving and performance skills.
9. Create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

The student teacher's effectiveness on these skills during TP experience and the quality thereof can be impacted by a variety of factors. Three of the factors, according to Beck (2002) are (a) the quality of preparation courses taken prior to TP experience (b) the supervision and feedback that the student teacher receives during TP, and (c) the relationships that the student teacher develops with other school personnel. Other influencing factors may include how the TP process is managed and its structure (Wyss, Siebert & Dowling, 2012).

Problem and Purpose of the Study

Our research study focused on both pedagogical and structural issues that impact TP but all the work is not discussed in this paper. In this section we highlight some background information related to TP and also state purpose of this article.

Placement of student teachers is a big challenge facing African universities, given the large number to be posted in host schools across broad geographic areas, be it urban, suburban, or rural. In most cases, detrimental stigmas exist regarding placement in rural localities. A study by Mukeredzi and Mandrona (2013) who looked at opportunities and challenges experienced by student teachers posted in the schools within the rural locations unearths possible reasons for this. First, the student teachers felt that the cooperating teachers "offloaded" their responsibilities to them. Another finding was that, the school administrators often requested student teachers depending on the staffing needs of their schools. This means that a student teacher ends up in a school that does not have expert host teacher in his or her area of concentration. Lastly they found that in understaffed schools, some cooperating teachers are relieved of their duty by the incoming student teachers and do not offer support. The student teachers are left alone with no one to neither monitor their lesson preparations nor guide their instruction.

A second challenge is lack of classroom ICT skills and knowledge. An investigation (Chen, 2009), of technology models that pre-service teachers' use to support instruction found disconnect between learners' technological needs and the teachers' readiness to support them. A study by Udeani and Ejikeme (2011) also points out "inadequate preparation in the use of ICT for teaching… [Yet] ICTs are having a huge impact on everyday classroom activities.… The obvious implication … is that teacher preparation programs must equip teachers with ICT skills needed for knowledge creation and dissemination" (p. 535). Many African governments recognize the ability to use ICT as being critical to the general society and in job markets. However, little attention is paid on furnishing student teachers with ICT skills since these resources are lacking or inadequate. Clearly the student teacher will not be ready upon graduation to integrate ICT, an essential skill in the 21st century.

A third challenge is large numbers of student teachers. Majority of African universities experience very large enrollments in teacher education programs. In Kenya for example, there has been massive expansion of varied local universities dealing with teacher education program with huge student enrollments, which exert pressures to both human and physical resources and are bound to lower the quality of TP. According to a survey carried out by Kenyatta University researchers in July 2012 as part of the baseline data for the Capacity Building through Teacher Education Project supported by the Higher Education for Development (HED) and USAID, the number of universities offering education degrees has increased from four national universities (Kenyatta University, University of Nairobi, Moi University and Egerton University) to thirty-six universities and constituent colleges (without counting private universities) in the last 10 years. An overwhelming 800% increase of student teachers with minimal increment in school placements or enough experienced supervisors to go around! These large enrollments lead to compromised excellence and expectations. Debriefing and discussion of feedback of observed lessons by the supervisors has become a rare feature of TP given that a supervisor has to observe many student teachers that also happen to be in different schools that are not of close proximity to each other. This forces the supervisor to exit quickly to supervise other student teachers without providing the appropriate support to the already observed student teacher.

Supervision is another factor impinging on the quality of TP. The current state of affairs shows that there are not enough instructors with expertise and skills to carry out effective TP supervisory roles. The new universities and university colleges have to share supervisors who originally were very able to handle fewer student teachers in the four national universities. Special content areas like foreign language have even less supervisors' forcing them to travel long distances to offer their expert feedback to student teachers. Consequently, the number of classroom observations given to each student teacher is minimal. For example, in 2011, Kenyatta University sent 2975 students for teaching practice. This is an insurmountable number of student teachers to be supervised by the limited number of supervisors. The data for these student teachers completing the TP exercise showed that while they were supposed to be observed and assessed a minimum of six times during the teaching practice, they were only supervised once or twice.

Beyond technological resources, inadequate preparation in ICT knowledge and skills, quality of supervision, there are a myriad of structural challenges that affect the quality of TP – the logistics, the large enrollments, placement and the infrastructure or financing of the TP exercise. These problems need considerations for the quality of TP to improve.

In this paper we only dwell on the pedagogical TP issues regarding (a) how the student teacher felt prepared, (b) was able to apply theories learned in a classroom situation and (c) perceived usefulness of feedback provided by the cooperating teacher, head of department, and the university supervisors.

Research Questions

1. To what extent does the teacher preparation program equip student teachers for their teaching performance expectations?
2. How adequately were the student teachers prepared to employ the learned abilities and skills when delivering content in the classroom?
3. To what extent did student teachers value the feedback given to them by the mentor teachers, school administration and TP supervisors?
4. What were the challenges experienced during the TP exercise?

Methodology

Sampling

Survey data were collected during student teaching semester in June, July and August of 2012 in Kenya from the participating University. The school placements were spread all over the country. At this time, the country had eight geographical provinces with a total of forty-seven districts. During this semester the TP administrators, subdivided the entire school placements into 30 TP zones. Each zone was assigned a faculty to serve as the area coordinator.

Strategic sampling was used to identify the zones and schools for data collection. A third of the TP zones were chosen leading to 10 zonal areas for this study. In each area, six schools were selected. The distribution of the schools in each TP area was as follows – a national school; a provincial boys' school; a provincial girls' school; a district boys' school; a district girls' school and a private school. Table 1 below summarizes the sampling grid for one of the TP zones and for each school, 6 student teachers were chosen. In addition, 4 cooperating teachers and/or Heads of Departments (HoDs) were selected; both the school principal and the area supervisor for each area were interviewed. Table 2 summarizes the total sample for all the selected 10 TP zones.

Table 1: Sampling Grid for One of the TP Zone

School Type	Number of Student teachers	Number of Cooperating Teachers/ HoDs	Principals	Area Supervisor
National	6	4	1	1
Provincial Girls	6	4	1	
Provincial Boys	6	4	1	
District Girls	6	4	1	
District Boys	6	4	1	
Private	6	4	1	
TOTAL	36	24	6	1

Table 2: Total Sample Grid for the Whole TP Research

TP Zone	No. Schools	TP students	Cooperating Teachers/HoDs	Area Supervisors
Nairobi East	6	36	24	1
Nairobi West	6	36	24	1
Kiambu	6	36	24	1
Muranga/ Nyeri	6	36	24	1
Kakamega/ Vihiga	6	36	24	1
Bungoma/ Busia	6	36	24	1
Kisii Area	6	36	24	1
Nyamira Area	6	36	24	1
Mombasa Malindi A	6	36	24	1
Mombasa Malindi B	6	36	24	1
Total	60	360	240	10

Instruments

A survey questionnaire was developed for collecting data from the student teachers. The first item dealt with biographic data about the participants including gender, teaching subject areas and type of school where the student teacher was placed. The second, third and fourth sections of the questionnaire focused on a self-evaluation of a range of pedagogical aspects of teaching based on a 5-point Likert scale questionnaire. For the same range of pedagogical aspects, the student teachers were asked to evaluate how well the teacher education program prepared them in acquiring these skills, the extent to which they were able to apply these skills during their student teaching practice and the extent to which the mentoring and evaluation feedback from their supervisors enhanced their ability to apply these skills in teaching. On top, there was an open-ended section on how to make TP better.

A different survey questionnaire was given to the cooperating teacher and HoDs. In many cases, the cooperating teacher was also the HoD. The questions in this survey focused on the same pedagogical aspects addressed in the student teacher questionnaire but asked the cooperating teachers and HoDs to indicate the extent to which the student teacher was able to apply these pedagogical skills in their teaching. The survey also included other information such as the frequency of observations they conducted with their student teachers.

The other two instruments used in data collection were interview schedules for the principal and for the area supervisor. The principal interview schedule focused on their views about the university's TP program and about the university student teachers at their school. The area supervisor interview schedule covered the number of student teachers in the area, the role of area supervisor, the challenges faced and the strategies adopted to address these challenges.

Data Collection

In each school a researcher a) administered TP students questionnaires to all student teachers at the school, b) administered the questionnaire to 4 Cooperating teachers/ Heads of Department (1 Mathematics, 1 Sciences, 1 Languages and 1Social studies), and c) interviewed the principal. The researcher also interviewed the TP area supervisor. The questionnaires were completed by paper and pencil by the respondents while the interviews were audiotaped and later transcribed.

Data Analysis

The data were synthesized using Survey Monkey. The descriptive statistics were generated and qualitative data grouped by question for further analysis. The student responses (1) on the extent to which they were well prepared with teaching skills, (2) to apply the skills and (3) usefulness of the feedback from supervisors were compared to identify areas with high percentage scores versus lower percentage scores. Because this was a self-rating survey, it is typical that students would rate themselves highly on most of the items. As such the scores on the highest level of the Likert scale were considered (the *Very Good* scale). Percentage scores above 50% were studied as areas of positive performance while scores with less than 50% were considered as areas of weakness. The qualitative data from the interviews and additional comments were read and re-read by the research team members to identify common themes.

Findings from Quantitative Data

Perceptions of How the Education Program Prepared Student Teachers for TP

The percentages of student teachers who checked the *Very Good* rating scale were generated as seen in Table 3 regarding the self-rating of how the teacher education program prepared the student teachers on the various pedagogical aspects of TP. Scores of less than 50% are highlighted in bold font.

Table 3: Student Teacher Perceptions on How Well Prepared They Were for Teaching Practice

Teaching Performance Aspect	*Extent of Preparedness (n= 177)*
Create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	66.7 %
Create learning experiences that make the subject matter meaningful to students	59.1 %
To foster relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.	58.7 %
Use a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills.	56.6 %
Plan instruction based upon knowledge of subject matter, students,	56.0 %

and curriculum goals.	
To be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and who actively seeks out opportunities to grow professionally	**49.7%**
Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	**46.9%**
Provide learning opportunities that support students' intellectual, social, and personal development	**45.8%**
Create instructional opportunities that are adapted to diverse learners.	**44.6%**
Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.	**44.0%**
Integrate ICT in my teaching.	**15.4%**

The student teachers felt adequately prepared in 5 out of the 11 pedagogical areas surveyed. The areas where there was satisfaction on how well they are prepared include: creating a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation (66.7%); create learning experiences that make the subject matter meaningful to students (59.1%); fostering relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being (58.7%); using a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills (56.6%); and planning instruction based upon knowledge of subject matter, students, and curriculum goals (56.0%).

The areas where the student teachers perception were low include: the ability to integrate ICT in teaching (15.4%); the use of formal and informal assessment strategies to evaluate and ensure continuous intellectual, social, and physical development of learners (44.0%); the creating of instructional opportunities that are adapted to diverse learners (44.6%); the planning of learning opportunities that support students' intellectual, social, and personal development (45.8%); the use of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom (46.9%); being a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and one who actively seeks out opportunities to grow professionally (49.7%).

Perceptions of How Student Teacher Applied Theory during TP

On the self-rating of the ability to implement various teaching and learning strategies in their TP, the percentage of student teachers rating the preparation as *Very Good* were generated as shown in Table 4. On the same list of pedagogical aspects, student teachers' ratings show that they were very able to apply all these skills during their teaching practice except in the area of ICT integration in teaching (20.9%).

Table 4: Student Teacher Perceptions of How Well They Were Able to Apply The Learned Skills During TP

Teaching Performance Aspect	*Ability to implement (n=177)*
To foster relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.	70.1 %
Create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	67.8 %
Create learning experiences that make the subject matter meaningful to students	62.7 %
Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	61.6 %
Provide learning opportunities that support students' intellectual, social, and personal development	58.8 %
Plan instruction based upon knowledge of subject matter, students, and curriculum goals.	58.5 %
To be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and who actively seeks out opportunities to grow professionally	57.1 %
Use a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills.	55.4 %
Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.	53.1 %
Create instructional opportunities that are adapted to diverse learners.	52.1 %
Integrate ICT in my teaching.	**20.9 %**

Perceptions of Effectiveness of Feedback from Cooperating Teachers/HoDs

Table 5 has data generated from the self-rating regarding the extent to which the cooperating teachers and/or HoDs evaluation and feedback enhanced the student teachers' ability to perform on the various pedagogical aspects of TP. The data shows that the teacher candidates found the feedback to be useful in enhancing their abilities on all of the pedagogical aspects of teaching except in three areas. One of the areas where the feedback was found not to be useful was the ability to be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others i.e. students, parents, and other stakeholders in the learning community, and who actively seeks out opportunities to grow professionally (49.4%). A second unhelpful feedback was the use of formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners (46.6%). The feedback on ICT integration in teaching was the least useful (17.0%).

Table 5: Student Teachers' Perceptions of the Effectiveness of Feedback from Cooperating Teacher/HoD

Teaching Performance Aspect	*Cooperating Teachers/HoDs: Feedback on effectiveness (n=177)*
Plan instruction based upon knowledge of subject matter, students, and curriculum goals.	63.8 %
Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	61.1 %
Create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	61.0%
Create learning experiences that make the subject matter meaningful to students	60.0 %
Use a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills.	59.1 %
Create instructional opportunities that are adapted to diverse learners.	58.1 %
Provide learning opportunities that support students' intellectual, social, and personal development	57.8 %
To foster relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being	52.0 %
To be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and who actively seeks out opportunities to grow professionally	**49.4 %**
Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.	**46.6 %**
Integrate ICT in my teaching.	**17.0 %**

Perceptions of Effectiveness of Feedback from the University Supervisor

Student teachers ratings on the effectiveness of feedback from university supervisor are in Table 6. The same three areas of unhelpful feedback from cooperating teacher/HoD are also noted with the university supervisor's data.

Table 6: Student Teacher Perceptions of the Effectiveness of University Supervisor's Feedback

Teaching Performance Aspect	*University supervisor: Feedback effectiveness (n=177)*
To foster relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being	59.6 %
Provide learning opportunities that support students' intellectual, social, and personal development	58.0 %
Create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	57.1 %
Plan instruction based upon knowledge of subject matter, students, and curriculum goals.	56.0 %
Create learning experiences that make the subject matter meaningful to students	52.0 %
Use a variety of instructional strategies to encourage students' development of critical thinking, problem solving and performance skills.	52.0 %
Create instructional opportunities that are adapted to diverse learners.	51.2 %
Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	50.9 %
To be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and who actively seeks out opportunities to grow professionally	**47.1 %**
Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.	**45.6 %**
Integrate ICT in my teaching.	**17.9 %**

In summary, the comparisons of TP teaching performance from Tables 3, 4, 5, and 6, reliably show low ratings for ICT integration. Other areas with consistently low rating are the use of formal and informal assessment strategies to evaluate, create instructional opportunities that are adapted to diverse learners and ensure the continuous intellectual, social, and physical development of learners.

Findings from Qualitative Data

In addition to the surveys ratings data, the student teachers were asked open-ended questions about other aspects of TP that they would like to see improved. Data from these responses were categorized into the following themes: resources, teaching methods, ICT, supervision, feedback and overall TP exercise. Two of these themes, ICT and supervision, are discussed below given the quantitative data are consistent with the qualitative data from interviews.

Information and Communication Technology (ICT)

The student teachers consistently cited ICT as an area they would like to see improved in their teacher education program. "The institution should encompass more ICT integration in TP training and provide material to facilitate improving the ICT in learning," noted one student teacher. Other student teachers pointed to the need for subject specific technology support: "…should be equipped with the ICT knowledge in order to apply it effectively in teaching of field work in Literature … other disciplines such as Geography require a lot of ICT.” The student teachers emphasized the following:

1. That ICT be made a course requirement that must be taken before being cleared for the TP exercise.
2. The need for ICT services to be open to all student teachers and not just to a select group of students i.e. those participating on grant projects, students teaching math and science subjects.
3. They called for opportunities to practice ICT skill; i.e. “Students should be given an opportunity to have an experience in PowerPoint presentation, not just learning about it verbally as this brought us challenges in the school where we had our teaching practice, since it has the facility but we lacked the knowledge.”

It is evident from the student teachers’ open-ended responses that they recognize the need and the potential ICT has to teaching and learning.

Supervision

The student teachers cited a number of challenges they experienced during TP that were connected to supervision and four are discussed herein. The first issue was the fact that supervisors are assigned by region rather than by subject area. Several student teachers point to the need to have supervisors who teach the observed subject areas e.g. a student teacher stated:” Lecturers (University supervisor) should be familiar with the subjects he or she is supposed to supervise.” Subject experts should be used preferentially for assessment. The second issue dealt with frequency of the university supervisor’s visits. Several respondents pointed to “Frequent supervision of the student teacher” and “the assessors [referring to university supervisors] should visit or see the students as many times as possible.”

The third issue was about the communication between the university supervisors, the student teachers and the school personnel. Some student teachers commented on the need for supervisors to let them know when they will be observed: “The supervisors are supposed to inform student-teachers earlier in advance and not have impromptu visits since most of us become tense.” Similar remarks pointed to communications between area coordinators, supervisors and the student teachers. “… also communications[sic] with the school administrators because the school programs are not fixed but sometimes flexible. That is, they are affected by some extra activities like AGM [Annual General Meetings], staff meetings and curriculum activities.” Lastly, several student teachers called for observation by external supervisors. Such comments included: “Apart from internal supervisors, external supervisors should be encouraged (motivated),” “Introduce the use of external examiners during supervision” and “External supervisors should be involve in supervision.”

Discussion and Recommendation

Student Teachers-Preparedness for Teaching

To what extent does the teacher preparation program equip student teachers for their teaching performance expectations? From the findings, the areas of well preparedness were closely tied to planning lessons, classroom instruction, the ability to create meaningful learning environment for students and engaging students in active learning. The student teachers felt they were not well prepared in six of the teaching performance expectations, in the areas enumerated below in the ability to:

1. Be a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other stakeholders in the learning community) and who actively seeks out opportunities to grow professionally

2. Use effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
3. Provide learning opportunities that support students' intellectual, social, and personal development
4. Create instructional opportunities that are adapted to diverse learners.
5. Use formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of learners.
6. Integrate ICT in teaching and learning.

Since these aspects are taught in general education courses, student teachers may be failing to see how these expectations connect to TP. We recommend a curriculum mapping exercise in which the student teacher performance expectations are mapped against the courses taken during TP. Periodic review of the curriculum is also necessary to ensure that the courses are up-to-date with current research on teaching and learning. Also an area of urgency of the curriculum that needs addressing in the education classes is how to handle students with diverse needs. It is important for student teachers to develop skills of supporting all learners in the classroom; because they are often placed in schools where the host teacher does not provide the much needed guidance. Thus, Mukeredzi and Mandrona (2013) propose that teacher preparatory programs should include a course that covers student teachers ability to persevere, and have "resilience, stress management and most importantly creativity and flexibility" (p. 151), and such a course is to be taken before the TP exercise.

Regarding the question 'To what extent student teachers valued the feedback given to them by their cooperating teachers, HoDs and supervisors?' the student teachers had low ratings in three (a, e, and f) of the above areas. These findings seem to point out student teachers inexperience to these aspects of teaching—Are student teachers provided opportunities to be reflective practitioners, use assessment in decision-making and incorporate technology in the classroom?

Student Teachers' Implementation Abilities

How adequately were the student teachers prepared to employ the learned abilities and skills when delivering content in the classroom? While the rating on how student teachers feel prepared is low, the rating on their ability to perform is much higher. Apart from ICT, the student teachers' high ratings on their ability to perform on the teacher performance expectations (see Table 4) may be a pointer to the degree of confidence they carry to TP. This could be attributed to the fact that they were completing these surveys during student teaching, a time when they are also faced with the stress of being evaluated on their performance. It is therefore expected that they would want to position themselves as performing strongly while at the same time pointing to a lack of preparedness in the event that they are thought not to be performing well.

Information Communication Technology (ICT)

The most critical and significant finding of our study that calls for urgent concerted efforts in the teacher education curriculum is ICT integration. It received the lowest ratings across the four categories of our study. It is evident that the student teachers have little or no preparation on ICT integration and lack the know-how of classroom-based technologies. There are also no clear expectations for student teachers to integrate ICT during TP. Given the increasing influence that technology has on teaching and learning today, it is critical that this issue is given utmost consideration as part of the teacher education program.

Any deliberation on how to make ICT part of the teacher education program needs to include the concept of technological pedagogical content knowledge (TPACK), which has emerged over the last decade. The TPACK framework is an interrelationship of content, pedagogy, and technology knowledge (Akarasriworn & Ku, 2010; Mishra & Koehler, 2006), which is a worthwhile knowledge base and endeavor in preparing effective teachers for the 21st century. Apart from teaching about technology integration, teacher education faculty need to model current appropriate technologies in their own classrooms and offer hands-on tasks so that student teachers not only learn about technology integration but also experience it in their own learning.

TP Challenges

Other dominant challenges experienced during the TP exercise relate to supervision. According to the *Student Handbook*, student teachers are initially meant to be observed by a pedagogy faculty to examine their schemes of work and lesson plans before they start teaching. After this, they are supervised at least six times, that is, a minimum of three observations per teaching subject (major and minor content area) during the three months of TP. The grade given at the end of TP becomes part of the student teacher's classification. This structure faces a number of challenges when it comes to the actual assignment of supervisors during TP. For instance there are not enough supervisors to observe each student teacher per the *Student Handbook* requirement.

Currently, the issue with supervision raised by student teachers about the need for subject area specific supervisors evaluating them during TP is problematic to overcome given the large TP enrollments and the vastness in mileage in which the postings occur. One possibility to ensure that the supervisors are versed with the subject content is to group them by the subject panel area such as Mathematics and Science Education, Social Studies Education, Language Education, Creative Art Education and Physical and Health Education. Any specialist in the subject panel areas should supervise a group of subjects e.g. Chemistry, Biology, Physics and Mathematics. When these supervisors visit a school site, they should be allowed to observe any student at that site who is teaching within the subject panel of their specialty. On the other hand, the student teacher should keep a visitation log in which the supervisors sign in to show what subject areas they have been assessed.

Regardless, there is need for institutions offering teacher education to plan and employ adequate staff in varied disciplines to offer expertise feedback during TP. The idea of using co-operating teachers as part of the staff, is good only if the responsibility does not go beyond mentoring the student teacher to writing a report to the university which could be used for grading and classifying the student teacher for graduation.

Another issue with supervision is lack of communication between and among the participants in the TP exercise - the TP placement office, the area coordinators, the university supervisors, the school administrators and student teachers e.g. the supervisors should inform student teachers in advance about classroom observation and not make impromptu visits.

Ayot and Wanga (1987) list in their book, fifteen principles "of effective supervisory feedback." These principles should be made accessible to supervisors. The first principle is in agreement with what Nguyen (2009) notes that, mentors or supervisors are to be supportive of student teachers to enable them reflect-in and reflect-on practice and also by being "clear in their expectations of self and other" (p. 660) i.e. the supervisor should have a good understanding of the relevant resources used in teaching in order to guide the student teacher towards the fundamental resources for adjusting a lesson plan to improve instruction. The purpose of doing TP will not be meaningful to the student teachers unless the feedback is reflective of their abilities and is informative. Supervisory feedback should help the student teacher improve in areas of weakness and the assigned grade should mirror the student teacher's efforts.

The student teachers can be provided with a reflection guideline or tool that is tied to the essential elements of instruction (Hunter 1986). Ochanji (in press) suggested some guiding questions for helping student teachers reflect on the essential elements of their teaching namely: (a) what goals did you have for your students for this lesson? (b) What learning activities did you engage your students with in order to help them make progress towards the learning goals? (c) How effective were these strategies in helping your students to make progress towards the learning goals? (d) What evidence of student learning and/or learning difficulties did you collect from your students?

Conclusion

Teacher education is an important part of human resources for national development. Thus it is important to build the capacity of teacher education of which TP is part of this process. We advocate for curriculum mapping of teacher education courses to ensure that appropriate ICT knowledge and skills are covered before TP by offering coursework on modern accessible ICT. Integrate ICT in the teacher education program to have graduates ready to meet the demands of the prevailing job market. Likewise, it is important for student teachers to develop skills on how to deal with all learners in the classroom. Thus the teacher education program should be reviewed to address content and skills on how to handle students with diverse needs and large classes.

Finally, the institutions offering teacher education should plan to have adequate staff in respective teaching areas to offer expertise during TP. The provision of expert feedback can even begin earlier, before TP, via facilitation of rigorous microteaching experiences. On top of training adequate TP supervisors, put careful consideration to school placements and in a timely manner coordinate the posting of student teachers.

References

Akarasriworn, H. & Ku, Y. (2010). Mathematics faculty members' roles, skills, and teaching experiences in a hybrid environment. In D. Gibson, B. Dodge (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference, 258–263*.

Ayot, H. O., & Wanga, P. E. (1987). *Teaching practice.* In D. M. Kiminyo (Ed.) *Series on provision of leadership training in primary teacher education supported by ODA through British Council HED Section*. Kenyatta University Faculty of Education and University of London Institute of Education.

Beck, C. (2002). Components of a good practicum placement: Student teacher perceptions. *Teacher Education Quarterly, 29*(2), 81-98.

Chen, R. (2009). Investigating models for pre-service teachers' use of technology to support student-centered learning. *Computers & Education, 55*, 32-42. doi:10.1016/j.compedu.2009.11.015

Council for the Accreditation of Educator Preparation (2013). CAEP 2013 Standards for Accreditation of Educator Preparation. Retrieved from http://caepnet.org/accreditation/standards

Du Plessis, E. C., Marais, P., van Schalkwyk, A. & Weeks, F. (2010). Adapt or die: The views of Unisa student teachers on teaching practice at schools. *Africa Education Review, 7*(2), 323-341.

Glickman, C. & Bey, T. (1990). Supervision. In W.R. Houston (Ed.), *Handbook of research on teacher education* (pp. 549-566). New York: Macmillan.

Groth, R. (2009). A qualitative approach to assessing technological pedagogical content knowledge. *Contemporary Issues in Technology and Teacher Education, 9*(4), 392-411.

Hunter, M. (1986). Madeline Hunter replies: Develop collaboration, build trust. *Educational Leadership, 43*(6), 68.

Leshem, S. & Bar-Hama, R. (2008). Evaluating teaching practice. *English Language Teachers Journal, 62*(3), 257-265. doi:10.1093/elt/ccm020.

Lewin, T. (2011, July 21). Training of teachers is flawed, study says. The New York Times. Retrieved from http://www.nytimes.com.

Mclntyre, J., Byrd, D., & Fox, S. (1996). Field and laboratory experiences. In J. Sikula (Ed.), *Handbook of research on teacher education* (pp. 171-193). New York: Macmillan.

Ministry of Education (2013). Quality Education for Development. Retrieved from www.education.go.ke

Mishra, P. & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108 (6),* 1017–1054.

Mukeredzi, T. G., & Mandrona, A. R. (2013). The journey of becoming professionals: Student teachers' experiences of teaching practice in a rural South African context. *International Journal of Educational Research, 62,* 144-151.

Nguyen, H. T. (2009). An inquiry-based practicum model: What knowledge, practices, and relationships typify empowering teaching and learning experiences for student teachers, cooperating teachers and college supervisors? *Teaching and Teacher Education*, *25*, 655–662.

Ochanji, M. (In press). Guided teaching for guided learning. Supporting elementary science teacher candidates during clinical practice. *Journal of Elementary Science Education*.

Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15* (2), 4–14.

Shulman, L.S. (1986). Knowledge and teaching: Foundations of the new reform. *Harvard Education Review*, *57* (1) (1987), pp. 1–21.

Udeani, U. & Ejikeme, C. (2011). Practicing teacher's perception of undergraduate preparation for science teaching in secondary schools in Nigeria. *Journal of Emerging Trends in Educational Research and Policy Studies*, *2*(6), 531-536.

USAID. (2013). Kenyatta University-Syracuse University partnership on building capacity through quality teacher preparation. Retrieved from http://www.usaid.gov/kenya.

Wyss, V. L., Siebert, C. J., & Dowling, K. A. (2012). Structuring effective practicum experiences for pre-service teachers. *Education*, *132*(3), 600-606.

This research was funded in part by the US Higher Education for Development (HED) and the United States Agency for International Development (USAID).

INFORMATION COMMUNICATION TECHNOLOGY INTEGRATION IN BIOLOGY INSTRUCTIONAL PROCESS IN SECONDARY SCHOOLS IN MIGORI COUNTY, KENYA

David Khatete
Kenyatta University
dkhatete@yahoo.co.uk

Eunice Owiti
Kenyatta University
owitieunice@yahoo.com

John Maundu
Kenyatta University
maundujohn52@yahoo.com

This paper studied constraints to integration of Information Communication and Technology (ICT) in the teaching and learning of biology in secondary schools in Migori County, Kenya. It employed descriptive survey design that utilized stratified, simple random and purposive sampling techniques. The study targeted education officers, all the secondary schools, all head teachers, all Form Three Biology teachers and all Form Three Biology students. The study was guided by the research question; what challenges do teachers and students identify in relation to ICT integration in biology? The study used a sample size of twenty-four (24) secondary schools. Research instruments included; questionnaires for use by biology students, structured interviews for biology teachers, head teachers, SCEOs and CDE, Observation schedules for biology lessons and ICT resource checklists. Data was analyzed through Descriptive and Inferential statistical procedures. The findings were presented in tables, frequencies and percentages.

Keywords: Integration, Constraints, Instructional Process, Secondary Biology

Introduction

This paper relates to capacity building through quality teacher education. Specifically, capacity building encompasses the country's human, scientific, technological, organizational, institutional and resource capabilities. A fundamental goal of capacity building is to enhance the ability to evaluate and address the crucial questions related to policy choices and modes of implementation among development options, based on an understanding of environment potentials and limits and of needs perceived by the people of the country concerned.

The problem of the study was that despite the critical role of ICT in sectors like banking, construction transport and communication, it has not been fully adopted in the teaching and learning processes in most developing countries like Kenya. While there is a wide range of innovations in ICT to support effective and quality of delivery of educational services, there is considerable technology lag in the Kenyan educational institutions. Most of the institutions still use nearly obsolete systems and consequently are unable to exploit educational potential of the emerging technologies. Information technology has played a big role in accelerating the movement of learning opportunities to all parts of the world, to learners of all cultures and nationalities. Building capacity through quality teacher education indeed forms part of this paper's recommendations.

Information technology is widely recognized as a vital resource in economic, social and political development. In the present world the skills of information technology are more than ever in great demand in all sectors including education, government, business and commerce (Rumpagapon, 2007). The importance of computers in life cannot be overemphasized as they deal with learning, employment, productivity and fun. Computers are used in banks, offices, military installations, stores, factories, schools/colleges, government agencies and even other organizations.

Biology plays a vital role in modernization, social and economic development in the world in general. It is a life science and almost all the processes in the human body involve biology. For instance we need biology in everything we do as animals for we walk, eat, sleep, and talk biology (Orodho, 1996). Students therefore interact with biology as a science in everyday life and therefore it is expected that they show better achievement in the subject. Excellence in biology education calls for the integration of various media, technologies and techniques to teaching and learning environment. Access to a new generation of ICT has brought new opportunities to teachers and learners in the biology. However the effective integration of such applications depends on teacher's familiarity with and command of the new resources. A study on the integration of ICT in the biology classroom is therefore a valuable addition to progressive biology teacher's development. Computer users today are not computer professionals; rather, they are people who need information to do their jobs effectively.

Electronic technology was in the past very mystified. It was extra-ordinary and belonged to only the experts and specialists. Yet in the recent past there has been transformation of learning through technology in all levels, removing inhibitions, obstacles and challenges (Maleki et al, 2012). Computers have created a revolution in the production, processing and transfer of information, primarily because of their ability to handle colossal amount of data within a very short time. The main use of computers, regardless of the application area, is processing or manipulation of data fast and efficiently in order to obtain information that is complete, accurate, timely, economic and relevant.

Use of ICT in education at all levels is limited by poor ICT infrastructure, weak policy and regulatory framework, limited number of teachers who are ICT proficient, low telecommunication services penetration and poor quality services. Access to ICT facilities is presently one of the major challenges in Kenya and other African countries. The constant display of low achievement in biology is a cause of worry to many stakeholders. In fact the public outcry and concern by parents and other educationists to enhance achievement in sciences in the national examinations is clear that the challenges to integration of ICT in the teaching and learning of the sciences need urgent investigation. This poor performance in biology could be attributed to several factors such as attitude, teaching approaches/methods, content and resource mobilization and management (Musyoka, 2004). Even with the introduction of SMASSE in 1998 and the making of ICT integration a government policy, little improvement had been realized in biology performance (Jesse, 2010). Appropriate ICT instructional activities can be effective in promoting the development of logical thinking as well as the development of some inquiry and problem solving skills in learners.

ICT integration in the classroom has been widely promoted through research, activities manuals, method courses and workshops for in-service teachers in Kenya and it is a key component of student-centered instruction that leads to greater performance in the subjects (Reid, 2002). However, it is far from being universally employed by biology teachers and students in Migori County; perhaps because of the various challenges facing teachers and learners which may include insufficient infrastructure or lack of computer facilities or may be due in part to the emphasis laid by the teachers on the passive 'telling' mode of traditional lectures.

The performance of students in science subjects in secondary schools in Kenya has continued to be low for many years. Reforming and improving instruction using ICT is one way to enhance quality and relevance of science education (Ajelayami, 1990). The government of Kenya has an important role in shaping national ICT policies and encouraging education institutions to utilize new technologies to transform pedagogy, research and development as far as education development and advancement is concerned.

Modern courses in biology beside the traditional teaching methods, particularly stresses the programmed education, which allows activity of all students in all phases of the training process, and thus enables their self-learning and self-control. Programmed education as a model of flexible differentiation implies acceptance of individual skills and pace of work of each student. In methodical terms that means programming of the curricula and their manner of treatment. Its' contents are reduced to what is relevant, logically structured in smaller parts, which are sorted by their complexity and that each student individually and gradually overcome, control results and their progress is monitored with regular feedback.

Aija and Inga (2012), state that historically the definition of ICT as educational method has been changing continuously. Famous philosophers and teachers think that educational method is; a tool in teacher's hands to promote cooperation with students, way how teacher organizes and leads students' work to knowledge, a tool that helps teacher to equip students with knowledge and skills by using intentional activity of students, a way how teacher delivers knowledge to students and leads the students' process of cognition; a way how students gain knowledge and skills, a way where teacher leads students from unknown to well-known, from no-skills to skills, a way to develop kids' possibility to think, a way of a pedagogical process where teacher leads students from unknown to well-known, a way of organizing students' process of cognition in order to provide getting the knowledge and practical skills, it is not only a tool in teacher's hands, but it is also an excellent tool to touch students' personalities.

The choice of correct ICT educational method is very important. It depends on the choice of ICT that will make a student feel bored in the lesson and the theme will slide over his brain and do not leave any knowledge or a student will perceive the theme as a game, as a part of his life and he will get the knowledge for all his life. It depends on the choice of ICT if a class will look upon the lesson as a drudgery and misbehave in the lesson or a class will be interested in the lesson and will behave well and help the teacher to lead the educational process. A possibility to judge logically, to move the correct conclusions based on the information is an integral part of ICT therefore development of students' critical thinking is one of the main tasks of a teacher.

In general, ICT integration in education carries considerable importance to shape the technology use and competencies of the future workforce. Positive experiences with ICTs help students to transfer these experiences to their own lives (Akbaba, 2006). In addition, it is not reasonable to expect learners to use ICTs responsibly and effectively if they are not exposed to relevant experiences during their training (UNESCO, 2002). Schools should be encouraged to embrace ICT integration by training various subject teachers, by providing digital educational materials for all subjects and by regularly exchanging views with school administration about ICT applications (UNESCO, 2002).

This study was expected to generate information on ICT use in teaching and learning for capacity building through quality teacher education. With changes in modern technologies learners need to be equipped with updated knowledge that will make them adapt to the changing world. Such knowledge leads to better communication and increased earnings as a result of better education and self- employment in the ICT sector. The study was also expected to generate knowledge on ICT impacts on education quality, access and challenges. It will bring to the fore the preparedness of teachers on the use of ICT right from teacher education institutions. This study was concerned with finding out the reasons as to why teachers rarely used ICT in biology teaching in Migori County.

Methodology

The study employed descriptive survey design that utilized stratified, simple random and purposive sampling techniques. Descriptive survey provided the important leads in identifying the needed emphasis and changes aimed at addressing the challenges facing integration of ICT in biology teaching and learning. It also enabled the researcher to obtain information on the challenges facing biology teaching and learning and to access the opinions of biology teachers and head teachers. Both quantitative and qualitative techniques were used. Quantitative data provided indicators of the challenges facing ICT integration in biology instructional processes whereas Qualitative data sought to establish the options to problem solving and helped suggest the way forward.

The study used a sample size of twenty-four (24) secondary schools that was 14% of the entire population. Research instruments included; questionnaires for use by biology students, structured interviews for biology teachers, head teachers, SCEOs and CDE, Observation schedules for biology lessons and ICT resource checklists. Data was analyzed through Descriptive and Inferential statistical procedures. The findings were presented in tables, frequencies and percentages depending on the research question. Responses from close-ended questions were organized, coded, converted into numbers and analyzed quantitatively using Statistical Package for Social Sciences (SPSS). Quantitative analysis gave vivid account of the situation under study, showed the relationship between variables and also attempted to advance alternative explanation derived from the data. Qualitative Analysis was used in responses from interviews and open-ended questions where some statements from interviewees were quoted verbatim. Inferential statistics specifically test of significance was used in order to determine whether the respondents' scores regarding their views towards challenges facing ICT integration in biology teaching and learning differed.

Results and Discussions

Table 1: Challenges to ICT Integration as Cited by Teachers

Challenge	Percentage
Inadequate modeling of pedagogical uses of ICT in training institutions and schools	89
Lack of electricity and other power sources in some schools	92
Limited access to computers and internet services	87
Poor ICT sustainability in schools	79
High cost of new technology content and equipment	88
Insufficient comfort with ICT use among teachers	93
Overcrowded classrooms and high student teacher ratio	78
Lack of digital content available to schools	91
Information overload and pace of change	87

From table 1 above, the following are the major constraints to ICT integration as given by the teachers.

Information Overload and Pace of Change

Our current educational system is not doing a good job in preparing students of make good use of the Global Library and other aids to information retrieval and use. In summary, the real problem that the teachers face is helping students to learn to retrieve, process, and appropriately use accumulated information. In this endeavor the teachers must deal with:

1. A continuing exponential growth in the totality of accumulated information.
2. Very rapid progress in the improvement of ICT systems and other (non-human) aids to the input, storage, processing, retrieval, and use of information. This rapid progress facilitates automation of many tasks that previously have been done by humans making use of less powerful aids.

Becta (2005), states that the effectiveness of computers has improved by a factor of more than two billion. Computerization of many different manufacturing and information processing tasks has moved us from the Industrial Age into the Information Age. The Global Library is steadily growing in size and processing power. The rapid progress in ICT is being pitted against the rapid growth in the totality of accumulated knowledge. This situation is somewhat confused by the fact that ICT is contributing substantially to the research that is leading to the rapid increase in knowledge. Unfortunately, the education component of addressing this racing situation is not doing well (UNESCO, 2004).

Our informal and formal education system has not yet shown that it can adequately prepare students for this rapidly changing information over-load problem. Some of the reasons for this poor performance lie in the training and in-service of teacher education systems. Certainly, we have made some progress. Currently pre-service teachers now enter teacher education programs with some ICT knowledge and skills, and most own or have ready access to a computer. However, the gap between the education-related ICT knowledge and skills of newly graduated teachers and the capabilities of the field of ICT in Education is growing. ICT in education is making progress, but we are falling further and further behind in terms of pace of change in the global world. Majority of the teachers cited this as a major hindrance to ICT integration.

Lack of Technical Expertise

Excellence in education calls for the integration of various media, technologies and techniques to teaching and learning environment. Access to a new generation of ICT has brought new opportunities to teachers and learners in the sciences particularly in biology. However the effective integration of such applications depends on teacher's familiarity with and command of the new resources. A study on the integration of ICT in the biology classroom is therefore a valuable addition to progressive biology teachers' development. Lack of skills in ICT integration in biology subject could be as a result of inadequate capacity pedagogical integration of ICT, limited ICT equipment, lack of incentives from both institutions and government to encourage using ICT, or the design of the teacher-training curriculum.

Poor ICT Infrastructure and Inadequate Facilities in Schools

The introduction of ICT in resource sharing has brought about a great transformation from the traditional approach to a modern approach. Academic libraries entrusted with the heavy task of providing readers with the latest or current and retrospective materials apart from improving their inter-library loan service, should take a number of wide-scale measures to improve and reinforce international cooperation in the area of exchange of publications and international lending services (Wachira, 2005). For instance, the online catalogues of collaborating libraries can be combined to create a "union catalogue" of holdings for multiple libraries, and added components can be configured to interface with the other libraries to enhance resource sharing. Moreover, the researcher found out that biology student per computer ratio was 1:15 in most schools in the County. Accessibility to resources could be the biggest challenge to both teachers and students. To those who are able to access the few computers available, contact hours could still be an issue due to the fact that they have to use the computers on limited time.

Compounded to this is the fact that even the few resources and equipment that are available in the schools cannot be sustained due to the fact that no allocation is made by the school administrators for maintenance and repair of the ones broken down.

High Cost of New Technology Content and Equipment

Even in light of tighter budgets, heads of schools have to make purchasing interactive technologies a high priority. In addition to going out into the community to do additional, personal fundraising, they should fundamentally update their purchasing criteria to ensure they fully maximize investments. Becta (2005) argues that the school management should not even consider a tool unless it integrates with current technologies and existing environments, as well as demonstrates ability to adapt easily to future potential needs. Teachers should use creative strategies to balance the need for new, innovative classroom technologies with the reality of tightening budgets. Becta (2005) argues that good management and professional practice can overcome these difficulties since some schools do offer a good quality education.

Lack of Digital Content Available to Schools

Although from the responses teachers gave this item as a hindrance to effective utilization of ICT in teaching and learning process, most of the teachers are not able to handle most ICT resources and therefore their training in ICT skills should come first. There is no need in availing materials of digital content if they will not be used and that even their storage and safety is not assured.

Inadequate Modeling of Pedagogical Uses of ICT in Training

Most teachers claim that during their training they never witnessed ICT use that can influence and convince them to be using the same in the teaching and learning sessions. They have no experience and no exposure to ICT use in instructional process. This should not be taken seriously though due to changing times and changing nature of instructional process. The fact that others did not use or are not using ICT should not discourage teachers from doing the same.

Conclusions

The findings from the study allow for the following conclusions to be made:

1. Secondary institutions are doing their best to acquire computers and other ICT resources for teaching, learning and administration purposes.
2. Students are enthusiastic in using computers for learning despite the high student computer ratio.
3. Public education institutions have a higher student to computer ratio than private ones.
4. Teacher to students computer ratio still high in most schools across the County
5. With regard to connectivity, access rates are still high and most institutions cannot cope with high cost of connectivity.
6. There is need for policy guidelines to cover education institutions with regard to ICT equipment and connectivity.
7. ICT Integration is still inadequate, more individualized than institutionalized.
8. Schools that have embraced public-private partnerships like cyber schools technology solutions have gone a long way to integrate technology in science subjects
9. Existence of computer clubs in some schools has enabled peer learning sharing and documentation of information.

Recommendations

Based on the findings of this study, the following recommendations can be made:

1. Schools and teachers in general are advised to embrace new technologies to focus more on the design of laboratory experiments and data interpretation
2. Use ICT in combination with conventional instructional methods for improvement in biology achievement
3. In all accounts of biology teaching process, teachers should equip themselves with relevant and up to date ICT knowledge and skills for effective classroom communication.

Acknowledgements: I sincerely thank my supervisors, Dr. David Khatete and Prof. John Maundu, for devoting their energy, time and patience while guiding me through this research. Similarly, I am indebted to the entire Comm-Tech department members for their constant encouragement and support.

References

Aija, C. and Inga, S. (2012). Use of ICT in teaching- learning Methods make school Math blossom. Journal of Procedia- Social Behavioral Sciences 69, 1481-1488. Retrieved from www.sciencedirect.com on 5th June, 2014.

Ajelayami, D. (1990). Science and Technology education in Africa: Focus on seven sub-Saharan countries. Lagos. University of Lagos Press.

Akbaba, A, S. (2006). Complexity of Integrating Computer Technologies into Education in Turkey. Journal of Educational Technology and Society [Electronic] 5(3), pp.367-369. Retrieved from www.sciencedirect.com on 8th June, 2014.

Becta (2005). *The Becta Review 2005 : Evidence on the progress* of ICT in Education. Becta ICT Research.

Jesse, S. N. (2010). *Computer assisted instruction and conventional instructional methods in science.* A comparative study of secondary schools in Embu district, Kenya. Master thesis. Unpublished.

Maleki, H., Majidi, A., Haddadian, F., Rezai, AM. & Alipour, V. (2012). Effect of applying information and Communication technology (ICT) on learning level and information literacy of students. Journal of Procedia- Social & Behavioral Sciences 46, 5862-5867. Retrieved from www.sciencedirect.com on 5th November, 2013

Musyoka, J. (2004). ASEI Movement and the PDSI approach. A paper presented during the 1st cycle of SMASSE project

Orodho, J.A. (1996). Factors Determining Achievement in science Subjects at secondary level in Kenya. Doctoral Thesis, Kenyatta University. Unpublished.

Reid, S. (2002). The integration of Information and Communication Technology into classroom teaching, Alberta journal of Educational Research. Vol.XLV111, No. 1

Rumpagapon, W.M (2007). Students' critical thinking skills, attitudes to ICT & perceptions of ICT classroom learning environments under the ICT schools pilot in Thailand, PhD thesis, University of Adelaide

UNESCO (2002). *Information and communication technologies in teacher education: A planning guide.* Retrieved October 19, 2013 from, http://unesdoc.unesco.org/images/0012/ 001295/129533e.

UNESCO (2004). *School networkings: Lessons learned*. Bangkok: UNESCO Bangkok (ICT lessons learned series, Volume II).

Wachira, E. (2005) "ICT in Education: A Practical Approach". In Bracey, B., Culver, T. (eds.) *"Harnessing the Potential of ICT for Education- A Multistakeholder Approach"* [Internet] United Nations ICT Task Force. Available from: <http://www.digitaldivide.net/comm/docs/view.php?DocID=199 > Accessed 23th October 2013.

USE OF COMPUTERS IN TEACHING AND LEARNING BUSINESS STUDIES IN SECONDARY SCHOOLS: WESTLANDS DISTRICT, KENYA

Bernadette K. Kiarie
Kenyatta University
bernakiarie2004@yahoo.co.uk

Wilson Kerich
Kenyatta University
wilsonkerich@yahoo.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Computers have permeated our everyday life in ways that were inconceivable twenty years ago. These multifaceted machines have changed the manner in which we do things including teaching and learning. In the developed world, using computers in classrooms has proved to be a worthwhile experience leading to a push for provision of computers for schools in developing nations such as Kenya. Policies have been laid out and frameworks developed to cater for provision of computers in schools. The agenda of providing computers for schools is articulated in Kenya's long term economic plan - Vision 2030; where Kenya hopes to be a regional centre for research and development in new technologies. This study sought to establish the availability of computers and where they are available establish whether Business Studies teachers and learners employ them for teaching and learning purpose.

Keywords: Computers, ICT, Teaching, Learning

Background of the Study

At the advent of computers, they were very large and expensive machines that could hardly find a place in the classrooms. However, today's computers are highly portable and can easily be put together with other Information and Communication Technology (ICT) devices such as the Liquid Crystal Display (LCD) projectors to change the learning environment for the better within a very short period of time. The role of computers in learning is simplification of reality, often with exaggerated cause-effect linkages that can be very effective in a teaching context (Garson 1987). Availability of computers to teachers and learners is paramount to their successful adoption as teaching tools. However, while it is true that computers have the ability to enhance the learning environment; they are not a replacement for the teacher and therefore are tools that teachers and learners can use.

The assumption that computer technology has become an essential part of the basic school curriculum was summed up in a report of the United States of America Department of Education (1969) where computers in the classroom were referred to as the 'new basic' of American education and the Internet as the 'new blackboard' of the future. Ultimately, teachers decide the resources they will employ during teaching and learning in their classrooms. Normally the tools used by a teacher in a classroom environment are those that he or she perceives to work in his or her favour and those that the teacher is familiar with. In other words, the attitude and familiarity of a teacher towards a teaching tool determines whether such a tool gets to the classroom environment or not.

In Kenya a study done by Wabuyele (2006) showed that teachers and school administrators feel that the use of computers in Kenyan classrooms is worthwhile. All teachers whether starting out or experienced can benefit from the use of computers and in the wider concept the use of Information and Communication Technologies (ICTs) in teaching and learning. New teachers can have access to a variety of resources for teaching and learning as well as learn a lot through their interactions with other teachers locally and abroad via the Internet. Those who have been teaching for long can also benefit in the same way plus get an opportunity to share their rich experiences with other teachers in the world.

In Kenya, there are no documented guidelines that call for teachers to teach using computers. Computers are provided in schools but it is upon the teacher to choose to use or not to use them for pedagogical purpose just like any other teaching tool that the teacher may have access to. However, there is an ICT policy in Kenya since the year 2006 where the government recognized that it is necessary to strengthen and streamline ICT training through promoting ICT in education at primary, secondary, tertiary and even community levels. Many Kenyan schools have computers that are used for various purposes. This study sought to find out whether these computers are accessible and utilized by teachers and learners for instructional purposes specifically in Business Studies. Although many computers have been donated to schools by the private sector and Non-Governmental Organizations (NGOs), their availability to and utilization by teachers and learners in Kenyan schools is worth investigating.

Problem Statement

Computers are useful in teaching and learning because they make teaching easier; for example computers are used in demystifying complex concepts in different subjects. Computers help students learn better by enhancing their learning environment and have the ability to increase learning resources. Availability of computers to Business Studies teachers is the first stage in the successful adoption of computers in teaching the subject in secondary schools. This is because teachers can only be competent and interested users of computers as teaching tools if such tools are available and easily accessible. Teachers will not adopt computer technologies into their instructional tasks if they are not available in the first place. There may be some challenges that hinder the use of computers in our classrooms; however, when effectively used computers have a striking effect on teachers and learners as was concluded by Reid & Rushton (1985). But, where computers are not used effectively, they do not add value to teaching and learning.

The evolution of microcomputers in the classrooms has been influenced by many factors including the way the teacher perceives them. Positive teacher attitude encourages the use of computers while a negative one hinders their use in the teaching and learning environment. This paper therefore seeks to reveal whether teachers and learners have considered it a worthwhile venture by using computers in teaching and learning of Business Studies where they are available and accessible.

Availability of Computers to Teachers and Learners of Business Studies in Schools

The use of the available computers to teachers and learners in schools determines the role that computers play in the classroom. Murdock & Desberg (1994) saw that students can use computers to break out of the walls of the classroom to share and have access to all the wonderful information and experience that is now possible. This paper sought to establish whether the Kenyan learners have access to this wonderful experience via their teachers in Business Studies as a subject. Although what gets learned from the use of computer in the classroom is not easy to evaluate, Candau et al (2003) agrees that access to computers can ignite students' thoughts and eventually move them towards a better learning experience. It is important to verify whether conclusions such as these hold in the Kenyan context.

Willoughby & Wood (2008) argue that the past several decades have produced rapid advances in computer technology and increased access to computers in both developed and developing nations. According to global statistics schools are becoming increasingly well equipped with computer hardware. In Kenyan secondary schools computers have been provided by the government supported by parents, development agencies such as NEPAD e-schools programme and the private sector including organizations such as banks and even airlines. The non-governmental support takes the form of donations of computer hardware from the corporate world or funding of the acquisition of hardware and software.

Teachers and Learners Attitudes towards the Use of Computers in Schools

Christensen (2002) clearly saw that teachers are the main gatekeepers of educational innovations into classrooms. Majority of learners' will obey and do what the teacher requires in the Kenyan culture. This therefore means that the success of any initiatives to implement technology in an educational program depends strongly upon the attitude of the teachers involved as seen by Yuen, Law & Chan (1999). Osondo et al (2010) showed that positive attitudes toward computers are positively correlated with teachers' extent of experience with computer technology. Familiarity with the use of computers in the classroom lessens anxieties and fears towards their use and increases confidence for both teachers and learners. The saying that practice makes perfect holds in relation to the use of computers in schools.

The confidence a teacher possesses in using computers together with accessibility of computers therefore greatly influence his or her effective implementation of the technology in the classroom. Positive teacher attitude toward computers is recognized as a necessary condition for effective use of all information and communication technology in the classroom of today. This research paper sought to ascertain whether the conclusions that have been drawn by researchers in other parts of the world and especially in the industrialized world hold in Nairobi Westlands District in the teaching of Business Studies.

General Benefits of Using Computers in Teaching and Learning

It is generally recognized that the adoption of computers for pedagogy in the developed countries has progressed well over time in terms of acquisition of basic skills in different areas of study. However, according to the Ministry of Education's National Information and Communication Strategy for Education and Training (2006), the impact of ICT on the educational goals in Kenya is still inconclusive. Nevertheless, reported observations have been: speedy opening up to new knowledge, better assessment results, improved communication and technical competence as well as decentralization in the delivery of educational services. The ministry also realizes the fact that computers have a more powerful role of increasing resources and improving the learning environment. This has been echoed by researchers such as Ivers (2003), Reid & Rushton (1985) and Carrington &Robinson (2009). These benefits can only be meaningful where a teacher sees that the learning environment (for the learner) is being improved in the same measure as the teaching environment (for the teacher).

According to Mann (2006) using computers in teaching can enhance student achievement. Undoubtedly computers do support the improvement of students' intrinsic motivation. The novelty of the technology is highly attractive to young people. Knowing the significance of motivation in learning, it is important to check whether computer use can bring about all the possible benefits. Computers have the ability to provide what text books cannot provide in all subjects Business Studies included; for example, using computers, students can easily do a project and compare data with students in far off areas through the internet. Research also shows that students who use computers are more engaged and more independent of the teacher in the classroom. Reid & Rushton (1985) puts it that, computers could provide instant feedback that provides the learner with the individual attention that drives him or her to great heights in terms of motivation that comes from within.

Another benefit of using computers in the classrooms is that it prepares students for the outside world as seen by (Mann 2006). This is a conclusion worth following up because, in order to get by in today's job market one must be proficient in the use of technology – specifically computers. At the turn of the 21st Century, most jobs require skills in computer application and Internet use. Educators such as teachers must prepare their students so that once done with school they will be marketable. The secondary school level is the best stage at which the use of computers must be insisted upon because learners gain independence and get to have their own identity that is different from that of the teacher and the parents. Secondary school therefore is the structure within which the use of computers should be seriously considered so as to take root and be carried into the tertiary level and eventually into the job market.

Methodology

This study used descriptive survey approach. Westlands District was purposively chosen because it has a diverse population that represents the general diversity of the Kenyan nation. The target population was 1,555 people made up of 23 school heads, 32 Business Studies teachers and 1500 Form three Business Studies students. Stratified sampling was used for the schools in order to represent the following strata; public versus private schools, boys, girls versus mixed schools and day versus boarding schools. Form three students were purposively chosen for this research paper because they had already chosen to do Business Studies up to Kenya Certificate of Secondary Education (KCSE) level. As for the students within each of these strata simple random sampling technique was used to select the students who answered the questionnaires. Thus a combination of sampling techniques was used to make the sample population as inclusive as possible. 8 head teachers, 8 Business Studies teachers and 300 Business Studies students made sample population of 316 participants.

Results

Availability and Accessibility of Computers to Teachers and Learners

Availability of computers in schools precedes their use in teaching. School heads, teachers and students were asked a number of questions that would inform on the availability as well as accessibility of computers in schools. However, this area of the research dwelt more on the head teachers because they are recognized as the managing authority in the provision of computers for their learning institutions. Eight head teachers were interviewed on the number of computers in their schools. The pie chart below shows how they responded.

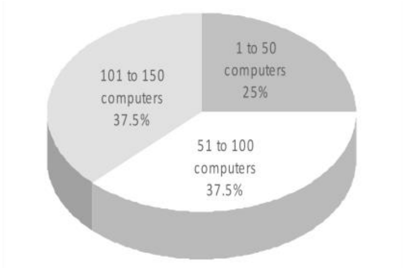


Figure 1: Number of Computers Available to Teachers and Students

The figure above shows that 100% of the head teachers have provided computers in their schools although the number varies from school to school. 37.5% have provided between 101 to 150 computers, another 37.5% have provided between 51 and 100 computers while 25% have provided between 1 and 50 computers in their schools. During the same interview, the head teachers 100% admitted that the ratio of computers to students was approximately 1:7 and was undesirable. Thus both public and private schools had computers in computer laboratories, staffrooms and in the school offices. Head teachers indicated that these computers were available to the teachers and their students in the staffrooms and computer laboratories respectively. In another question on whether the computers they have provided are enough; 87.5% of the head teachers admitted awareness that the computers are not enough with 62.5% saying that they were working towards achieving a one to four (1:4) computer to student ratio as recommended by the Kenyan Ministry of Education and Kenya Institute of Curriculum Development (KICD). This is realistic, given the current situation where there are three computer labs in the national schools and one or two in all the other schools.

Worth noting also was how the heads of school acquire the computers used in schools. Table 1 below shows the response to a question on how the head teachers get the computers.

Table 1: How Head Teachers Get Computers for their Schools

How do you get computers for the school?	Frequency	Per cent
Through donations	2	25.0%
Through partnerships	5	62.5%
through buying	1	12.5%
Total	8	100.0%

When head teachers were asked how they acquired computers for use in their schools, 62.5% indicated that they received computers through partnerships, 25% through donations and only 12.5% received them through buying. The majority of the computers were got through partnerships with either hardware and software companies/agents or Computer for Schools Kenya (CFSK) a Non-Governmental Organization (NGO) that has gone a long way in getting computers into Kenyan secondary schools. This concurs with what the Ministry of Education (2006) realized that availability of computers in schools is supported by parents, development agencies and the private sector. Public schools in Kenya were not initially financed by the government to get computers for their teachers and learners. This is an indication that the government could take up the responsibility of providing computers to schools because it is difficult for head teachers to procure computers cheaply plus it would be cheaper for the government to buy the computers on large scale maximizing on economies of scale. Establishing a computer supply program especially for public schools would also help to achieve Kenya's vision 2030.

Teachers will use computers in the classroom in the schools where the computers are easily available. Eight Business Studies teachers one from each participating schools filled in a questionnaire for this study. One of the questions sought their opinion on the sufficiency of computers in the schools where they taught. Table 2 below summarizes their responses.

Table 2: Teachers' Opinion on Sufficiency of Computers in Schools

There are enough computers in the school	Frequency	Per cent
Strongly agree	2	25.0%
Agree	2	25.0%
Undecided	1	12.5%
Disagree	2	25.0%
Strongly disagree	1	12.5%
Total	8	100.0%

The teachers' responses were split with 50% of them agreeing that there were sufficient computers in schools and the other 50% disagreeing or undecided. There was no consensus among the teachers on whether computers are enough or not. Could the teachers being undecided indicate that they have not used the computers in their classrooms to competently decide whether they are enough or not? Another issue in the questionnaire for the teachers seemed to clarify this by asking them to respond to access to computers in the schools.

Table 3: Teachers Access to Computers

Teachers have access to computers in the school.	Frequency	Per cent
Strongly agree	6	75.0%
Agree	1	12.5%
Undecided	1	12.5%
Disagree	0	0%
Strongly disagree	0	0%
Total	8	100.0%

87.5% of the teachers agreed that they have access to computers in schools. This gave a clear indication that computers were available to majority of the teachers. They were further asked how often they access computers 62.5% teachers indicated that they have daily access to the machines in school with the rest at 37.5% saying that they could access computers 2 to 3 times in a week. This level of access is good enough for a teacher to use computers for teaching and learning. However there was need to know whether the teacher is able to carry this technology to the classroom or the access was only in the staffrooms and offices in the school. The 37.5% of teachers who had access to computers two to three times a week may be an indicator of high teacher to computer ratio in the schools where a single computer in the staffroom is for the entire staff thus not allowing daily access.

Today's learners are enthusiastic about new technologies especially those that have to do with ICT. Two hundred and forty six Business Studies learners filled in a questionnaire for this study. In one of the questions they were asked to give their opinion on whether computers in their schools were enough to be used for teaching and learning purpose. Their responses were summarized as follows:

Table 4: Students' Opinion on Sufficiency of Computers in Schools

There are enough computers in my school	Frequency	Per cent
Strongly agree	59	24.0%
Agree	95	38.6%
Undecided	13	5.3%
Disagree	54	22.0%
Strongly disagree	25	10.2%
Total	246	100.0%

When combined those who strongly agreed and agreed that there are enough computers were 62.6%. A cumulative 32.2% disagreed and strongly disagreed that the computers in schools are enough and a small percentage of 5.3% was undecided. This concurs with the opinion of the teachers as well as that of the head teachers. Although computers are available in schools, this study shows that they are not enough for the school population. This agrees with the findings of Tanui et al. (2008) that, although computers may be present in Kenyan secondary school classrooms they are hardly enough for pedagogical purposes.

The students were asked to give a response to another statement that, students are allowed access to computers in school. Their replies were summarized as shown in Table 5 as follows:

Table 5: Students' Opinion on Access to Computers

Students are allowed access to computers for learning	Frequency	Per cent
Strongly agree	18	7.3%
Agree	111	45.1%
Undecided	49	19.9%
Disagree	32	13.0%
Strongly disagree	36	14.6%
Total	246	100.0%

A cumulative 52.4% strongly agreed and agreed that they are allowed access to computers in their schools while another cumulative 27.6% disagreed and strongly disagreed indicating that they are not allowed to use computers in their schools. A sizeable 19.9% were undecided on whether they are allowed access to computers in schools. While school heads are keen on providing computers to teachers and learners, their access to these machines for use as teaching and learning tools has been left hanging for the teachers to decide whether or not to use them. Some teachers encourage the use of computers by giving assignments that necessitate the students to seek access to the computers in the schools. As an observation during the interviews, the head teachers are keen on the security of computers in their schools. The computer laboratories were well secured and students needed to be with their teachers in the laboratories at all times. It is the opinion of the researcher that such strict measures prevented some students from having access to the computers when their teachers were not available.

Utilization of Computers by Teachers and Learners in Schools

After establishing the availability of computers in the schools this paper sought to know whether they were used for teaching and learning of Business Studies that is an elective subject in Kenya's 8-4-4 system. All the three levels of participants; teachers, students and the school heads had their input in this area. However, the emphasis was on the teachers who are the real implementers of teaching technology and tools in the classroom. This is because although the heads of schools may have provided the computers, they cannot take them to the learning environment for the teachers. The students too cannot have computers in the classroom without the authorization of their teachers. Teachers are the ultimate decision makers in relation to the use of computers in the classroom environment.

There are a few things that must be in place for computers to be used in the classroom. For example, computers require electricity to function and LCD projectors are necessary to project materials from the small computer screen to serve many students at a go. Technical help in many instances is required especially to make it smooth for teachers who may not be too confident to set up what they want. With all this in mind, head teachers were asked whether there was electricity supply in their schools and they all at 100% confirmed that they have electricity connection from the national grid but they raised the issue of blackouts as 50% of the schools did not have backup in case of power outages. During their interviews, all the head teachers at 100% also confirmed that power terminals were available in the computer laboratories and classrooms.

The participating teachers were asked whether the schools had Liquid Crystal Display (LCD) projectors that could be used with computers to project learning materials for many learners at a time. This revealed that 75% of the schools have LCD projectors while 25% of the schools did not have a projector. This showed that majority of the teachers had the necessary equipment that was required for them to use computers for teaching and learning. On further investigation the teachers revealed that 62.5% of the schools that took part in this research had capable computer technicians while 37.5% of the schools did not have computer technicians. It was noted in this study that the schools that do not have a computer technician were all public schools. It was therefore assumed that it could be because the government does not employ that kind of labour force for the schools and so the responsibility is left to the board of governors whose secretary is the head teacher. May be Kenyan teachers need to do what was done in Britain in the year 2003 where teachers asked for help in order to be able to integrate computers in the classroom (Ivers 2003).

All the participants confirmed during data collection that they use computers with an awe-inspiring one hundred per cent (100%). The researchers then zeroed in on the objective of the study on the use of computers to teach Business Studies and directly asked the head teachers whether Business Studies teachers used computers to teach in their schools. 50% of the head teachers said that the Business Studies teachers do not use computers to teach. 37.5% of the head teachers amazingly were not sure whether Business Studies teachers use computers in their classrooms and only 12.5% of the head teachers indicated with certainty that Business Studies teachers use computers to teach the subject in his school. This was a shocking revelation that although the head teachers are keen on providing the computers they are aware of their disuse or do not know whether they are used or not. However, the head teachers indicated that there are some subjects where computers are used especially the Sciences such as Biology, Chemistry and Mathematics.

Business Studies teachers were asked whether they use computers to teach the subject. Their responses were as shocking as those of the head teachers with 62.5% of Business Studies teachers saying that they do not use computers to teach. Despite the positive attitude towards computers and their provision in schools these teachers were not using them to teach. The students were also asked about their level of experience on the use of computers during the Business Studies lessons. A majority of 54.1% pointed out that they had no experience at all on the use of computers in learning Business Studies as a subject while 43.1% had a little experience as shown on table 6 below.

Table 6: Students' experience on use of computers in Business Studies lessons

Do you have the experience of using computers in learning Business Studies?	Frequency	Per cent
Not at all	133	54.1%
A little	106	43.1%
A lot	6	2.4%
Missing	1	0.4%
Total	246	100.0%

The students' responses indicated that the technology had not been integrated in the teaching of Business Studies confirming what the teachers and the head teachers had said. The turn of events in this study became surprising because researchers such as Willoughby & Woods (2008), Smerdon (2000) and Shue (2009) confirm that computer use in the classroom improves the teaching and learning environment to great heights. The researchers are of the view that perhaps the few years of gradual development of computers in Kenyan schools is still too short a period to create a natural culture of computer use. Although the United States Department of Education (1996) considered the Internet as the blackboard of the future, the situation in the Business Studies classrooms in Westlands District of Nairobi County is far from conforming to this. Students opinion on whether they are encouraged to use computers to learn the subject was split but the majority at 61% indicated that they are not encouraged by their teachers to use the computer as a learning tool. In the same breath 91.9% of the students agreed that teachers should be encouraged to use the computer as a teaching tool to enhance learning environment. This brings the realization that the assumed prevalence of technology has not eliminated the underutilization of computers in the classroom as seen by Willoughby and Wood (2008).

Teachers and Learners Attitudes Towards the Use of Computers in Schools

All head teachers 100% agree that computers have a place in the teaching and learning environment. They all quoted vision 2030 and the economic stimulus programme that has encouraged the development of the general IT industry starting at the secondary school level. All teachers at 100% also showed a positive attitude towards the use of computer in the classroom confirming that positive attitude usually comes before the use of ICT tools.

Recommendations

1. A replica of this study in all subject areas in Kenya would be helpful in giving a direction to ICT in education today and in the future.
2. A replica of this study to compare the rural and urban areas could shed more light in the area of using computers in Kenyan schools.

Conclusions

The availability and utilization of computers in teaching and learning will correlate positively upon the realization that the school curriculum must be reviewed with the computer as a teaching tool in the minds of the reviewers. Just like the current curriculum was developed with the print media and the black board in mind, it is time to change the mindset by including and allowing the use of the computers in teaching and learning. Further, the teacher must be the first to acquire this technology for the classroom and with confidence such that he or she can convince the learners that it is a worthwhile technology to incorporate in the learning process. This therefore calls for training of the teacher trainers as well as the classroom teachers and the teachers to be on the pedagogy of the computer technology. While the novelty of computers in schools can present a challenge to teachers it is a motivation tool for the learners. The teacher's challenges in relation to use of computers should be addressed and the learner's motivation sustained in the same measure in order to realize the possibilities offered by the computer as an instructional tool.

References

Candau, D., Hannafin, R., Doherty, S., Judge, J., Kuni, P. & Yost, J. (2003) *Intel teach to the future: With support from microsoft*. London: Institute of computer technology.

Christensen, R. (1997). *Effect of technology integration education on the attitudes of teachers and their students*. Unpublished doctoral dissertation, University of North Texas. Retrieved from http://courseweb.tac.unt.edu/rhondac/.

Carrington, V. & Robinson, M. (Ed) (2010). *Digital literacies: Social learning and classroom practices*. London: SAGE Publications Ltd.

Ivers, S. K. (2003). *A teacher's guide to using technology in the classroom*. Westport: Green Wood Publishing Group.

Garson, D. (1987). *Academic microcomputing: A resource guide*. California: Sage Publications Inc.

Mann, J. (2006). *Do we need computers in the classroom?* Ed 610, (1). Retrieved from http://www.faculty.umb.edu/peter_taylor/mann.doc.

Ministry of Education (2006). *National information and communication technology (ICT) strategy for education and training June 2006*. Nairobi: Government Printers.

Murdock, E. & Desberg, P. (1994). *Computers in the curriculum: Exercises for integrating technology into instructions*. California: WM. C. Brown Communications.

Osondo, J., Indoshi, F. & Ongati, O (2010). *Attitudes of students and teachers towards use of computer technology in Geography education: educational research* vol 1(5) pp 145-149. Retrieved from http://www.interesjournals.org/ER/pdf/2010/june.

Reid, I. & Rushton, J. (1985). *Teachers, computers and the classroom*. Manchester: Manchester university Press.

The United States of America government (1996). *The report of the US Department of Education: Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge* retrieved from http:/www.nssa.**us**/tech_journal/volume_1-3/vol1-3_article_10.htm

Wabuyele, L. (2006). *Computer use in Kenyan secondary schools: Implications for teacher professional development*. Proceedings of society for information technology and teacher education international conference pp 2084-2090. Chesapeake, VA: AACE. Retrieved from http://www.editub.org.

Willoughby, T. & Wood, E. (2008). *Children's learning in a digital world*. Sidney: Blackwell Publishing Limited.

Yuen, H., Law, N & Chan, H. (1999). *Improving IT training for serving teachers through evaluation: An advanced study in computers and communications in education.* Amsterdam: IOS Press.

WHAT SHOULD THE FOUNDATION PHASE TEACHERS KNOW? A CONTENT ANALYSIS OF A LEARNING GUIDE

Faith K. Kimathi
University of KwaZulu-Natal
fkkananu@gmail.com

Carol Bertram
University of KwaZulu-Natal
BertramC@ukzn.ac.za

Research on the teachers' knowledge base required to support children literacy development and teaching of reading and writing at the foundation phase (FP) in South Africa and other developing countries is scarce. One way of describing what this knowledge is, is to analyse the content that is taught in teachers' education programmes in South Africa. This paper explores what the Advanced Certificate in Teaching (ACT) programme believes is the knowledge base for FP teachers in South Africa context. Using Reed's (2009) domains of teacher knowledge (TK), the paper describes the content analysis of Module 4 to establish the assumptions about the literacy theories and knowledge that FP teachers should know to teach literacy. The findings shows an amalgamation of the seven domains of TK with a strong emphasis on the subject knowledge, pedagogic knowledge and the self-knowledge domains. In addition, teachers are required to view literacy as a multidimensional process and engage with research based reading theories. However, there seems to be an assumption that teachers already have content knowledge and thus the literacy theories are not explicitly taught in the module.

Key words: Literacy Knowledge Base, Teacher knowledge, Foundation Phase, South Africa

Introduction

The purpose of this paper is to examine the kinds of literacy knowledge and concepts a teacher should acquire from a professional development (PD) programme to enable effective teaching of reading and writing at FP. The data comes from the document analysis of one of the Learning Guide of ACT programme at the University of Kwa Zulu-Natal (UKZN) in South Africa. This intended curriculum assumes that, the enrolled practising teachers will acquire literacy knowledge and skills, contextualize and enact the knowledge into effective classroom teaching.

The Learning Guide (Module 4) claims that the key elements of a quality teacher is measured by the kind of specialised literacy knowledge that focuses on the subject knowledge and pedagogic content knowledge (Module 4, pg. ix). These domains of TK are crucial for a competent, adaptive and dynamic teacher, who is determined to teach the young children how to read and write.

At this critical phase of learning, teachers' knowledge for teaching literacy should be grounded on research- evidenced principles of emergent literacy and the five components of reading (Piasta, Connor, Fishman, & Morrison, 2009). From this perspective, the authors' design of this Module links these principles of emergent literacy to the domains of TK. For instance, the Module comprises of: literacy content knowledge, skills, learning and reflection tasks about reading and reading at the FP level, altogether addressing the knowledge base and literacy knowledge a teacher should know to enable effective teaching at FP level.

So, this paper presents findings and claims about the domains of TK and theories of teaching reading and writing that the FP teachers are expected to acquire from the programme. The findings from this content analysis of the intended curriculum informs the next phase of my PhD study, which is an exploration of teachers' learning from the ACT programme.

Background to the Study

Teaching at the FP in South Africa

Accumulative studies agree that although the education system has shifted positively after the establishment of the democratic government in 1994 in South Africa, most of the learners continue to struggle with literacy and mathematics at the FP which signals the need for urgent and substantial improvement. (Fleisch, 2008). For instance, in 2007 the Department of Education conducted a second cycle of systemic evaluations at the FP level which involved the assessment of a random sample of 53 972 Grade 3 learners from 2 327 primary schools across the country (Department of Education, 2008b). The results were a duplication of the first evaluation conducted in 2001 and 2002 where large numbers of children were reported to be unable read or write (DoE, 2008b).

However, the results showed a positive increase in performance in literacy from an average score of 30% in 2001 to 36% in 2007 and in numeracy from an average score of 30% in 2001 to 36% in 2007(Department of Education, 2008a). These statistics closely mirror those of the Annual National Assessments (ANA) test scores confirmed in 2012 by the National Education Evaluation and Development Unit (NEEDU) report. If this report diagnosis is accurate, building knowledge among the practicing teachers should be one of the key factors in improving these trends. Indeed, research evidence also indicates that the majority of teachers at the FP especially in the rural schools where resources are limited know little more about the subjects they teach than the curriculum expects of learners (Taylor, Draper, Muller, & Sithole, 2013).

One of the major strategies to amend this phenomenon is to provide all the South Africa schools with highly qualified teachers (Department of Basic Education and Department of Higher Education and Training, 2011; DoE, 2008b; Taylor et al., 2013; Taylor & Taylor, 2013).This approach assumes a qualified teacher does not only have an academic certification from education institutions but rather is a highly qualified, professional person who has acquired and possesses a specialised knowledge in the discipline they teach.

The Advanced Certificate in Teaching (ACT) Program at the UKZN

In 2013 the UKZN launched ACT course as an initiative designed to replace Advanced Certificate in Education (ACE) programme according to the new teacher education policy framework and targeted the practising teachers in KZN province especially those in the historically disadvantaged communities (Department of Basic Education and Department of Higher Education and Training, 2011). The new programme is understood by the Department of Basic Education (DBE) to be an important tool for improving teachers' competence in teaching literacy, mathematics and life skills (DBE, 2012). Meaning, the DBE supports the programme as an explicit measure to improving the subject matter knowledge for the FP teachers in the three content areas in the school curriculum as defined by the new Curriculum and Assessment statements (CAPS).

The programme aims to accredit the PD of teachers with a prior qualification in FP teaching at a lower level or to reskill qualified teachers in a new teaching focus, that is, teaching in the FP. This gives practising FP teachers, especially those from historically disadvantaged contexts an opportunity to obtain a higher qualification and deepen their knowledge. The intended curriculum of ACT programme consists of eight modules (Learning Guides) which are delivered to the teachers through mixed mode 'distance' education, which includes face-to-face teaching sessions, and interactive materials, within two years.

The Learning Guide selected for the analysis is one of the three literacy modules is entitled: *ACT Module 4: Teaching reading and writing in Home language in Foundation Phase (EDEC 104): Learning Guide.* The main goal of the module is to provide practicing FP teachers with opportunities to: deepen their subject matter knowledge and improve the general methodology in relation to teaching Grade R to 3; to develop appropriate knowledge, skills, values, attitudes and dispositions of teachers within the fields of FP curriculum, policy and pedagogy; and to enable student teachers to develop disciplinary, pedagogical, practical and situational learning and reflexive competences in teaching and learning in the FP (Department of Basic Education and Department of Higher Education and Training, 2011; Hill & Khuboni, 2013).

Literature Review of this Study

What is the Teachers' Knowledge Base for Teaching Literacy?

Reed (2009) developed a conceptual frame work on the domains of TK in which subject or disciplinary knowledge, pedagogic knowledge, and school knowledge (which includes learners' and curriculum knowledge) domains are actively interrelated with the teacher's personal knowledge(which includes teachers' academic skills). Initially the author used this framework to conceptually understand the domains of TK privileged in three sets of literacy distance education materials in the South African context.

> This frame draws from classroom studies in the UK conducted by Banks, Leach, and Moon (1999), and the works of other theorists such as; Cochran-Smith and Lytle (1999); Morrow (2007); Adler, Slonimsky, and Reed (2002) for the South African context and Darling-Hammond (2006) for the USA context. Altogether these theorists argue that teachers acquire these domains of knowledge from formal teacher education programs and their working contexts. Reed's conceptual framework is appropriate for this particular content analysis because it focuses specifically on the literacy TK base.

With reference to the knowledge base for teachers in South Africa, Adler and Reed (2002) describes the field as complex where many researchers find it difficult to relate TL to the kinds of knowledge a teacher is expected to have in order to execute their main duties. Other researchers like Bertram (2011) view teacher learning (TL) as a complex and a continuous process which is supposed to equip teachers with adequate knowledge to enable them execute their duties effectively and thus cannot be acquired with a single event or activity. She explicitly states that, practicing teachers have a knowledge base in place and PD activities are expected to boost this knowledge base by offering appropriate decontextualized formal and informal contextualized learning opportunities for teachers. This view, supported by empirical evidence also suggests that, classroom practices are determined by the teachers' personal beliefs, experiences and identity. For instance, a study conducted among FP teachers in a South African context and practicing in working-class or rural areas tended to emphasise teaching as care-giving rather than highlighting the instructional aspects of the work (Hoadley & Ensor, 2009).

Therefore there is a need to recognise the domains of TK which are essential for the teaching of literacy and other subjects at FP level. This is an area of concern in the field of teacher education in most of the developing countries. The purpose of this paper is to present the findings and claims made on the kinds of TK privileged in Module 4 used in ACT programme about teaching literacy at the FP level. The next section provides literature on the kind of literacy knowledge a teacher should hold to enable effective teaching at the FP level.

What Kind of Literacy Theories and Principles That a Teacher Should Know in Order to Teach at FP Level?

In 1997, the National Reading Panel (NRP) organised by United States (US) government assessed the status of research-based knowledge and the effectiveness of various approaches to teaching children to read. According to this panel, research findings support the inclusion of five components in the teaching of reading at the elementary level, namely: phonemic awareness, phonics, fluency, vocabulary and comprehension (National Reading Panel, 2000). Similarly, the International Reading Association (2003) states that:

> Teachers should be well prepared to implement research-based programs and practices, and they must have the knowledge and skills to use professional judgment when those programs and practices are not working for particular children. (pp.1-2)

The new curriculum CAPS (Department of Basic Education, 2011) explicitly adopts this notion of teaching the five components of reading. According to accumulating literature and other education researchers, to teach reading and writing effectively one requires to enact a specialised body of knowledge. This body of knowledge is complex and made of actively relating blends of TK in emergent literacy and English language structure; explicit knowledge on the literacy concepts, systematic and explicit knowledge on reading components and approaches; effective teaching strategies to enable children literacy development (Kuccer & Silva, 2013; Moats, 1999, 2009, 2014; Piasta et al., 2009).The person who can enact this specialised knowledge is a highly qualified professional teacher who acquires the TK from a formal programme and informally from their working contexts.

The desire to understand this specialised body of knowledge in literacy is created by the fact that a gap continues to prevail between classroom practices and the research-based TK on how to teach reading and writing at the FP level in SA context (van der Merwe & Nel, 2012). Informed by research, the table below details the assumption of what the teachers need to know to teach reading effectively at the FP.

Table 1: The Relationship between the Components of Reading and Teacher Knowledge

Reading Components (To be Taught at FP)	Kinds of TK Needed to Teach the Components of Reading (A Blend of Subject Knowledge and Practice-Focused Knowledge)
Phonemic awareness	TK on how to recognise relationships in phonological processes, reading, spelling and vocabulary is vital. These skills enable the FP teachers to equip the young readers phonemically and support their ability to blend and divide phonemes (sounds) that are associated with graphemes. Teachers are able to precisely identify and make decisions about confusable sounds and words.
Phonics	A teacher should be able to recognise prefixes, suffixes, roots and morphological structure of words to help learners to recognise words, draw the meaning and recall the spelling more easily. Phonological awareness is also tied other decoding skills or approaches.
Fluency,	Teachers need to have the language structure knowledge at the sub-lexical level, at the level of semantic organisation and discourse structure to enable them assign learners appreciate reading texts and techniques to enable learners achieve fluency in reading and subsequently writing at this phase of learning.
Vocabulary	Teachers' knowledge of English language structure such as phonology, semantics, morphology, orthography, syntax, pragmatics and grammatical rules and meaning is vital to enable teaching of vocabulary.
Comprehension.	This requires the teacher to apply the linguistic concepts such as the text organisation, genre, pragmatic and syntax (sentence/text structure) knowledge.

Compiled from van der Merwe & Nel, 2012; Moats, 2009.

This implies that, the literacy TK base has both theoretical and practical aspects, where the formal gives an understanding of the subject –literacy theories and concepts and, the latter gives the teacher the strategies of teaching. The next section is on methodology which explicitly describe how the Reed's conceptual framework was used to identify the various domains of TK privileged in Module 4.

Methodology-Content Analysis of Module 4 - the Learning Guide

In accordance to the qualitative content analysis procedures and scope of the study, the seven domains of TK from Reed's (2009) conceptual framework became the criteria used to engage with the TK privileged in Module 4. Below I have provided a table to illustrate the schematic arrangement of the seven domains of TK as established in module 4 in relation to Reed's categories.

Table 2: The Seven Domains of Teacher Knowledge Coded in Module 4.

Acronyms used	Indicators of the Domains of Teacher Knowledge as Provided by Reed
Subject knowledge	Content material that relates to literacy and reading theories at the FP
Pedagogic knowledge	Materials on methods or strategies of teaching reading
Learners' Knowledge	Knowledge of how learners learn
Curriculum knowledge	Knowledge of the current school curriculum
Contextual knowledge	Materials that locates reading and the teaching in a sociocultural context
Self-Knowledge	Knowledge that reflects teachers' identity as a learner (past) and teacher (present)
Academic skills	Materials that aims to extend teachers' academic reading and writing competencies

These domains were used as deductive categories and systematically assigned to the module's text with the assumption that, there was a relationship between frequency of content and meaning (Cohen, Manion, & Morrison, 2011; Kohlbacher, 2006). This means, the seven domains of the TK formed the deductive codes for the document analysis, facilitating a clear understanding of the kind of TK privileged in the ACT literacy intended curriculum which the FP teachers were expected to learn.

The first step of this document analysis consisted of counting the precise occurrence of the paragraphs of text and activities, key points and academic skills icons as per the designers' plan. Essentially this quantitative approach was used preceding the qualitative content (discourse) to acquire an overview of the 'units' under analysis. In addition, summarizing of categories in this manner is a statistical technique which allows trends, frequencies, priorities and relationships to be calculated (Cohen et al., 2011).

The second step involved reading, identifying and coding the denoted domains of TK on each page of the module, using different colours to represent the seven domains of TK by Reed (2009) in each of paragraph of texts and activity; key points and academic skills icons.

This was done either on a **bulleted**, **numbered or short sentence** or **small paragraphs** in the four units (chapters) depending on how the domains of TK are presented by the designers of module 4. The purpose was to establish what and how the seven domains of TK were presented and integrated to each other in the selected material.

Lastly, the coded texts were explicitly examined to sort out those that had more than one coding and determine exact under circumstance that the codes were awarded with the category. This was necessary because the seven domains of TK are not presented in a distinctive manner but rather some of the units of analysis had to be coded in more than one domain. For instance, it was not easy to separate subject knowledge and pedagogic knowledge domains or self-knowledge from the learners' knowledge domain which often overlapped in the whole Learning Guide.

Findings of the Content Analysis

The findings on Figure 1 below, indicates, high privilege of subject knowledge and pedagogic knowledge domains and moderate representation of self-knowledge and learners' knowledge domains. The knowledge of curriculum and academic skills knowledge domains have the least representation and variation from this dimension of graphic demonstration.

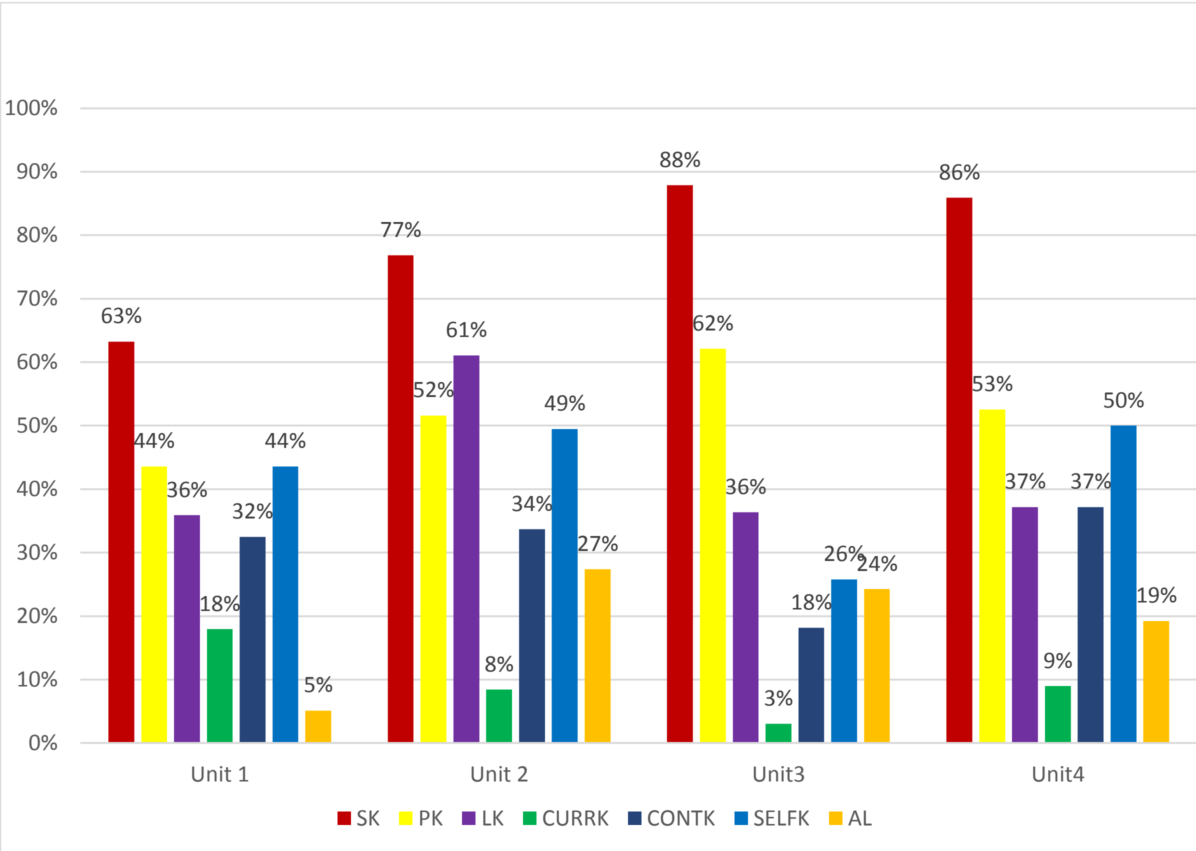


Figure 1: The Domains of Teacher Knowledge Privileged in Module 4

Although the table indicates that much of the text focuses on subject knowledge, the categories of pedagogic knowledge, learner knowledge, context knowledge, self-knowledge and academic literacy have a strong practice focus. Thus overall there is a strong focus in the module on 'how' knowledge, rather than theoretical knowledge. For example, here is an activity where the FP teacher must do a task on reflecting on her own knowledge about phonemic awareness in English. However the module does not explicitly define and explain the concept.

> Do this exercise to check your own phonemic awareness in English. Which of the following words does not rhyme with the others: book, ball, look? How many phonemes are there in the word ‘laugh’..? Say classroom without ‘room’. Say road without /d/ (Module 4, p. 45)

The above drawn conclusion about the findings of this content analysis echoes some of the research works in the South Africa context. For instance according to the works of Adler et al. (2002), teachers do not only need a deep knowledge of the subject they teach but rather a blend of propositional. Practical and personal knowledge for the purpose of effective teaching and learning. Since it is clear from the above analysis that the main focus of the module is on subject knowledge and practice knowledge, the next section aims to engage in more depth with the substance of the literacy knowledge privileged in the module. It answers the question: What kind of reading approaches are espoused in the module?

What are the Approaches to Reading that are Advocated in the Module?

The module supports both the Phonics-based (‘Bottom-Up’) and the whole language (‘Top- Down’) approaches for teaching reading, and the balanced approach that is a combination of the latter (Module 4, p.16). Although the module supports the phonics-based (‘bottom-up’) and whole language (‘Top-down’) approaches in teaching how to read, more emphasis is put on balanced approaches in the module. The ‘Bottom-Up’ approach to read out words which enables the decoding of the text. ‘Top-Down’ approach on the other hand assists the learners to acquire meaning of words from the text and subsequently comprehend the reading.

Therefore the use of phonics is a necessity in teaching reading, but it is not sufficient to achieve the main goal of reading and writing - making meaning of the text (Module 4, pp. 48-50, Activity 2.2.3 and 2, 2. 4). The module commits Units 2 and 3 on how to teach reading using the three approaches so as to meet the needs of diverse learners. This implies that, the teachers may use phonics-based approaches for the slow learners, while others can progress better with whole language methods in multilingual contexts such as South Africa. The text extract below summaries this section as follows:

> …Policy makers have to consider some hotly contested issues…Past and current trends in reading-teaching theory: Phonics; whole language; and balanced approaches. Policy makers need to be aware of debates and evidence from research on effective ways of teaching literacy (Module 4, p. 14).

The Balanced Approach is an emergent literacy perspective method that tries to reconcile the whole language and synthetic phonics approaches to early reading and writing. In the module the conceptual description of the three reading theories, are only discussed on page 16 and even on that text the emphasis is on how the teacher can use the these approaches of reading. Implying that, the subject knowledge on the approaches of reading is not explicitly taught in Module 4, while the contextual or practical knowledge on how to apply three approaches of reading in the classroom is highly privileged in Unit 2 and 3.

From that view, the module promotes and explicitly focuses on effective strategies of teaching the five research based components of reading and writing which are reinforced by the emergent literacy paradigm. Thus the module does focus on phonemic awareness, phonics, fluency, vocabulary and comprehension but does not engage in great depth on the understanding the language structure which support the teaching these concepts.

What is the Stand of the Module About Emergent Literacy at the FP Level?

According to the emergent literacy paradigm, children are visualised as young literates who come to school loaded with different knowledge and skills, so the role of the FP teacher is to support and build the learners' literacy on their prior knowledge through teaching of the five research based components of reading (Gunn, Simmons, & Kameenui, 2004). This means, children literacy development is a process which starts earlier before formal schooling. The extract below from the Key points' icon in Unit 1 summarises the foundations of literacy that young children brings to the school context and should be observed by the teachers from their behaviour.

> …Before children start learning the standard codes for reading and writing, they develop necessary pre-literate knowledge, skills and attitudes. This means that they begin to develop language and knowledge of print long before they begin formal school in Grade words… (Module 4, p.8)

And to nurture this children's literacy development process the following support system from the classroom teacher and learners' contexts is emphasised in the module as indicated on the Key points' icon in Unit 1:

> …Teachers need to find ways to connect children's knowledge from home with literacy activities in school. Teachers and families are partners in helping children to become literate… (Module 4, p. 11)

Therefore, teaching reading and writing at the FP, from the emergent literacy perspective is essentially a process where the teacher builds on the children' oral language as pointed out in Module 4, page 18 about the kind of knowledge brought to school by the Grade R learners.

> …Children often have some of this knowledge and skill before they arrive in Grade R… children demonstrate knowledge of print when they pick up a book, hold it the correct way up, turn pages in the correct direction…but you need to do specific activities that will tell you what children already know… (Module 4, p.18).

According to the Department of Education (2009), emergent literacy should be nurtured formally in school using learners' Home Language (HL) the familiar knowledge and gradually the teachers introduces the additional language(s) in enhancement of the bilingualism and multilingualism (DBE, 2011). So, teachers' strategies such as guided reading that are introduced in HL in Grade 1 are also used in Grade 2 help to build children's literacy development to a new level which is First Additional language (FAL). (Module 4, pp. 54-55 on reading strategies). Findings on such literacy development process are discussed in the next section.

Principles of Additive Bilingualism and Multilingualism

The subject and practical knowledge privileged in Unit 1 and 2 explicitly supports 'additive bilingualism' and multilingualism principles in teaching literacy at the FP. According to these principles, when children enter formal learning, those who are literate in their HL can easily transfer much of their previous cognitive knowledge of the reading and writing process to the new concepts or FAL. In support of this notion, Mbatha (2012) and Mashiya (2011), argue that, children learn more easily to read and write in their HL because they come to school fluent in speaking and usually with a significant vocabulary. As a result, they do not re-learn reading but rather learn how to integrate meaning as they read and write in their HL or FAL (DBE, 2011). For instance children taught phonics in HL, do not need to learn sound-spelling relationships all over again in English as illustrated by the text from page 49 about strategies of teaching phonics using HL knowledge on Figure 2 below.

Activity 1.5.1 Using Home Language to Read for Meaning
This activity should take about 30 minutes.

1. Read the following to a very young child, who cannot yet read. When you read, ask the child to 'read' with you. Notice which words she can 'read'.
    i. Sawubona bhuti.
    ii. Yebo, sawubona sisi.
    iii. Unjani?
    iv. Ngikhona. Wena unjani?
2. Record what you notice during the reading.
3. Write down why you think she can read some of the words. (Module 4, pg.12)

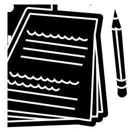


Figure 2: Activity 1.5.1 Which Supports Additive Bilingualism Approach in Reading

The text specifically illustrates how the early beginners can be assisted by their teachers to read and write in an English lesson from an additive bilingualism approach. First, the learners are exposed to activities and familiar words in their HL such as the IsiZulu greetings and then the learners are expected to decode English sentences using their prior knowledge during a typical English literacy lesson. This means that learners benefit from classroom practices that allow them to apply and expand their literacy understanding to a new context using more predictable and supportive materials in English. Such notions of 'additive-bilingualism' and subsequently multilingualism are prominent in Unit 2 and 3 – where the teacher first is expected to develop a strong literacy foundation in HL grounded in the children's culture and context and then, builds the FAL literacy on it. However module 4 does not emphasis the differences of teaching English as a HL or FAL- this notion is covered in Module 6 and beyond the scope of this document analysis.

Basically the modules encourages teachers to expose the children to correct use of the additional language(s) in the same way as they expose them to their home language: through repeated use in stories, songs and conversations.

> …Children use their home language to support their additional language. For example, if they do not know a word that they need in a sentence, they often use a home language word in its place. For example 'Thandi wants to wash izitsha'. This strategy is called 'code switching'... (Module 4, p. 13)

The module in this particular extract addresses teachers using IsiZulu as Language of Learning and Teaching (LoLT) or any other HL, the advantages of bilingual or multilingual child in a learning environment. This means that Module 4, follows general guidelines to accommodate the needs of all teachers especially whose LoLT is IsiZulu or any other of the official languages in the South African context irrespective of the structural differences in these languages.

Teachers can only achieve this concept of multilingualism by getting involved in different tasks from different background within the range of the children's conceptual background. Next, I present the overall discussion about the findings and claims made from this content analysis.

Discussions and Conclusions

The main findings from this analysis show that the module assumes that FP teachers need to know about the theories of emergent literacy, bilingualism, multilingualism. They need to know about the top-down and bottom-up approaches to teaching reading, and are encouraged to use the balanced approach. To a large extent the module focuses of the five components of reading and expects teachers to be able to use these in their classrooms. However, the module assumes that teachers already have an in-depth knowledge of concepts such as phonics, phonemic awareness, vocabulary, reading comprehension and fluency. As a result the module does not offer explicit knowledge about the structure of the literacy and English language which is the backbone of teaching these component and overall literacy in the classroom.

The implication for TK as drawn from the Module using Reed's framework indicates the need to equip the FP teachers with explicit subject knowledge not only on emergent literacy and components of reading but also on dimensions and literacy structure to enable teachers cope with the complexity of their classroom practice.

Lastly, there are particular constructivist and learner-centred assumptions that underpin the emergent literacy theory. From a learning perspective, which will be the next phase of my study, it will be interesting to see if teachers subscribe to these assumptions. Much of the literature on South African classrooms indicates teaching reading for decoding rather than for meaning (Hoadley, 2012). So the focus of this module on emergent literacy and reading for meaning may be different from the way in which the FP teachers currently teach. The next part of the study on TL, will focus on *how* and *what* selected teachers have learned about literacy through the programme.

References

Adler, J., & Reed, Y. (2002). Challenges of teacher development: An investigation of take-up in South Africa (1st ed.). Pretoria: Van Schaik.

Adler, J., Slonimsky, L., & Reed, Y. (2002). Subject-focused INSET and teachers' conceptual knowledge-in-practice. In J. Adler & Y. Reed (Eds.), Challenges of teacher development. An investigation of take-up in South Africa. (pp. 135-152). Pretoria: van Schaik.

Banks, F., Leach, J., & Moon, B. (1999). New understandings of teachers' pedagogic knowledge. In J. Leach & B. Moon (Eds.), Learners and Pedagogy (pp. 89-110). London: Paul chapman.

Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. In A. Iran-Nejad & D. P. P. (Eds.), Review of research in education, 24. Washington: American Educational Research Association.

Cohen, L., Manion, L., & Morrison, K. (2011). Research Methods in Education (7th ed.). London: Routlegde.

Darling-Hammond, L. (2006). Constructing 21st-century teacher edication. Journal of Teacher Education, 57(3).

Department of Basic Education. (2011). Curriculum and Assesment Policy: First Additional language for Grade 1-3, Foundation Phase. Pretoria, South Africa: Department of Basic Education.

Department of Basic Education. (2012). Report on the Annual National Assessment 2012: Grade 1 to 6 & 9. Pretoria, South Africa.

Department of Basic Education and Department of Higher Education and Training. (2011). Integrated strategic planning framework for teacher education and development in South Africa 2011 - 2015. Pretoria, South Africa.

Department of Education. (2008a). 2007 Grade 3 SE leaflet. Pretoria, South Africa: Department of Education.

Department of Education. (2008b). Report on the Foundation phase conference. Pretoria, South Africa.

Department of Education. (2009). Report of the Task Team for the Review of the Implementation of the National Curriculum Statement. Final Report. Presented to the Minister of Education, Ms. Angela Motshekga. Pretoria, South Africa.

Fleisch, B. (2008). Primary Education in Crisis: Why South African schoolchildren underachieve in reading and mathematics. Cape Town: Juta & Co, Ltd.

Gunn, B. K., Simmons, D., C., & Kameenui, E. J. (2004). Emergent Literacy: Synthesis of the research: U.S.A. Department of Education:Office of Special Education Programs.

Hill, A., & Khuboni, F. (2013). Advanced Certificate in Teaching (ACT) Foundation Phase ACT 4 Learning Guide: Teaching reading and writing in home language in foundation phase. Pietermaritzburg campus: School of Education, University of KwaZulu-Natal.

Hoadley, U. (2012). What do we know about teaching and learning in South African primary schools? Education as Change, 16(2), 187-202.

International Reading Association. (2003). Position statement: Investment in teacher preparation in the United States Newark, Delaware.

Kohlbacher, F. (2006). The use of qualitative content analysis in case study research Sozialforchung (FQS) (Vol. 7). Berlin: Institute for Qualitative Research.
Kuccer, S. B., & Silva, C. (2013). Teaching the dimensions of literacy. New York: Routledge.
Mashiya, N. (2011). IsiZulu and English in Kwa Zulu natal rural schools: How teachers fear failure and opt for English. South African Journal of Childhood Education, 1(1), 19-31.
Mbatha, T. (2012). IsiZulu teachers' perceptions of the foundations for learning literacy programme in four townships primary schools. A journal of Language learning, 28(1), 59-72.
Moats, C. (1999). Teaching reading is rocket science. Washington, DC: American Federation of Teachers.
Moats, C. (2009). Still wanted teachers with knowledge of Language. Journal of learning disabilities, 42(5), 387-391.
Moats, C. (2014). What teachers don't know and why they aren't learning it: addressing the need for content and pedagogy in teacher education,. Australian Journal of learning difficulties, 19(2), 75-91.
Morrow, W. (2007). Learning to teach in South Africa. Pretoria: HSRC Press.
National Reading Panel. (2000). Report of the National Reading Panel: Teaching children to read No. 00-4769. Washington, DC: National Institute of Child Health and Human Development.
Piasta, S. B., Connor, C. M., Fishman, J., & Morrison, F. (2009). Teachers' knowledge of literacy concepts, classroom practices and students reading growth. Scientific Studies of Reading, 13(3), 224-248.
Reed, Y. (2009). A conceptual framework for analysing the selection and organisation of content in teacher education materials. Journal of Education, 47, 173-194.
Taylor, N., Draper, K., Muller, J., & Sithole, S. (2013). National Report 2012: The state of literacy teaching and learning in the foundation phase. Pretoria: National Education Evaluation and Developmet Unit.
Taylor, N., & Taylor, S. (2013). Teacher knowlegde and professional habitus. In N. Taylor, S. Van der Berg, & Mabogoane (Eds.), Creating Effective schools (pp. 202- 232). Cape Town: Liesbet van Wyk.
van der Merwe, Z., & Nel, C. (2012). Reading literacy within a teacher preparation programme: What we Know and What we Should Know. South African Journal of Childhood Education, 2, 137-157.

INTEGRATING GUIDANCE AND COUNSELING MODELS INTO TEACHER TRAINING

John M. Kiweewa
St. John Fisher College
jkiweewa@sjfc.edu

In spite widespread calls to integrate counseling and guidance into teacher education, efforts at such integration remain fragmented, while psychological and social issues continue to afflict school-age children. Grounded in both empirical and theoretical literature, this paper calls for integration of counseling and guidance into teacher training. Utilizing critical aspects of child and adolescent developmental theory, this paper will evaluate current attempts at such integration, and propose adoption of a comprehensive counseling and guidance model into teacher training. Additionally, a summary of the current state of counseling and guidance in some parts of sub-Saharan Africa will be discussed.

Keywords: Counseling and Guidance, Teacher Training, Comprehensive Guidance Model

General Introduction

At the 2nd International Conference on Education Dr. Luke and I presented a paper entitled, The Interface of Human Development Theories, Curriculum, and Instructional Methodologies: Letting What We Know Inform What We Do. In that paper, we argued that for educators to enable children to develop and learn to their full potential, their pedagogical processes must be informed by some foundational knowledge about human development (Kiweewa & Luke, 2011). We presented a body of knowledge which, tied together, represented the developing child as a system that influences and is influenced by physiological, psychological, and ecological systems and processes. As Lee (2010) compellingly argued, the child as a psychological system, for instance, is embedded within the symbiotically linked, evolving, and dynamic processes of thinking, feeling, and perceiving—themselves informed and shaped by the child's individual personality; ecological context; relationships within those contexts; sense of identity and self-efficacy; and participation within and across multiple settings. Building on these and other observations, this paper calls for integration of counseling and guidance into teacher training curricular.

Definitions and Historical Background

There appears to be consensus in both theory and practice that counseling and guidance are two distinct concepts (Hui, 2002). While guidance has been described as a mentoring process that involves dissemination of information to facilitate individual decision making for personal and social development (Uganda Ministry of Education & Sports, 2005), counseling is understood as a process of enabling an individual or group of individuals to explore and deal with emotional, cognitive, and behavioral influences that may hinder adaptive functioning within a given context. In spite the noted differences, experts agree that counseling and guidance encompass three areas, namely educational, vocational, and personal social (Gysbers & Henderson, 2000; UNESCO, 2000).

Historically, many African governments have long been aware of the need for education systems to integrate counseling and guidance services into their education curricula (UNESCO, 2002). Such recognition was in part informed by multiple international efforts to address glaring shortcomings within existing national policies and practices that impinge on the overall development of sections of the population. Both the 1993 Ouagadougou Declaration and Framework for Action (Ouagadougou, Burkina Faso) and the 1995 Fourth Conference on Women (Beijing, China), for instance, highlighted the plight of women and called on policymakers to make the education of women a priority within the larger context of human development. A key area of consensus from these and other gatherings was that counseling and guidance ought to be integrated within child education and, thus, in teacher training curricula (UNESCO, 2002).

In 1997 a Board of Governors involving African ministers of education, was established and tasked with advancing policies and procedures to guide the development of counseling and guidance. With help from several regional and international agencies a Guidance Counselling and Youth Development Center for Africa was established in Lilongwe, Malawi. Although it has been over a decade since its founding—with the purpose of building capacity through training of individuals to address issues affecting children and youth in Africa—counseling and guidance efforts remain largely fragmented. Many member states continue to struggle to develop their own national centers, while others are still working on integrating counseling and guidance policies within their existing education policies. It is unclear, however, how many individuals have been trained at the center to date. These challenges, however, must be viewed within the larger context of well-documented challenges facing the development of professional counseling across the continent (Okech & Kimemia, 2012; Okocha & Alika, 2012; Richards, Zivave, Govere, Mphande, & Dupwa, 2012; Senyonyi, Ochieng, & Sells, 2012).

In spite of noted challenges, counseling and guidance is now part and parcel of many national education policies. Although the need for counseling and guidance services in schools was recognized in the 1970s in Kenya, for instance, only recently has such a need been fully instituted (Okech & Mimemia, 2012; Owino & Odera, 2014). In the case of Uganda, the Ministry of Education and Sports updated its earlier 1968 counseling and guidance policy in 2004, and later established the department of counseling and guidance as an autonomous entity within the ministry in 2008 (Senyonyi, Ochieng, & Sells, 2012). Similar efforts have been noted in Bostwana (Stockton, Nitza, & Bhusumane, 2010), Nigeria (Okocha & Alika, 2012), Zimbabwe (Richards, Zivave, Govere, Mphande, & Dupwa, 2012), and Malawi (Maluwa-Banda, 1998).

While the accelerated efforts by various governments to streamline counseling and guidance services in schools owe much to the larger strategies to combat the HIV/AIDS epidemic particularly among young people (Okech & Mimemia, 2012), these efforts have benefited from a growing recognition of the interaction between students' overall emotional wellbeing and academic and behavioral outcomes (Barry, Clarke, Jenkins, & Patel, 2013). Drawing on evidence from cross-cultural research the inextricable link between teaching/learning and social and emotional wellbeing of students has been acknowledged (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). Indeed, developmental researchers have long posited a strong positive association between effective social-emotional competency and academic performance as well as overall wellbeing. Difficulties in social-emotional wellbeing, on the other hand, have been linked with such negative outcomes as poor academic performance, behavioral problems, inattention, poor peer relationships, and poor overall adaptive skills (Dimmitt, 2003; Mghweno, Mghweno, & Baguma, 2014). Others have highlighted some of the effects negative environmental conditions and social stressors may have on cognitive, behavioral, and emotional functioning. These include poor academic performance (Ager, Akesson, Stark, Flouri, Okot, et al., 2011; Barry et al., 2013; Chireshe, 2011), truancy, absenteeism, and difficulty concentrating (Peled, Jaffe, & Edleson, 1995).

The evidence, therefore, points to the need to systemically and thoroughly address students' social and emotional needs and connect such supports to stronger academic achievement. On the basis of such evidence, there have been increasing efforts to develop counseling and guidance programs in schools. Published reports of such programs, where they exist, show overwhelmingly positive outcomes for student participants. A review of the

HealthWise Program, a school-based substance use and sexual risk prevention program in Cape Town, South Africa, revealed a moderately positive effect on the substance use and reduction in high risk sexual behaviors of high school students (Smith, Palen, Caldwell, Flisher, & Graham, 2008). A similar program, Resourceful Adolescent Program (RAP-A), for secondary school students in Mauritius yielded significant improvement in participants' depressive symptoms, hopelessness, self-esteem, and coping skills (Rivet-Duval, Heriot, & Hunt, 2011). In Uganda, the SUUBI-economic empowerment intervention program for AIDS-orphaned children in final year of primary school has produced similar positive results. The program is designed as career guidance intervention that involves creating asset-building skills and life options through 1-2 hour workshops and monthly mentorship on life options (Ssewamala, Waldfogel, & Ismayilova, 2012; Ssewamala, Han, & Neilands, 2009). A systematic review of the program revealed increased self-esteem, improved academic performance, self-rated physical health, reduction in sexual risk-taking intentions, and decrease in depressive symptoms. Similarly, Mghweno et al.'s (2013) study, in spite methodological limitations, found student access to counseling and guidance services was positively correlated with positive attitudes towards career choice.

These programs are by no means meant to be representative of what is happening on the African continent. Indeed, this paper makes no attempt to 'sum up' or create a whole picture of counseling and guidance applications across the African continent. Rather, these offer examples of counseling and guidance initiatives that, taken together, point to increased appreciation and utilization of these services. What is also noteworthy is that all the projects described above have been implemented in collaboration with or by teachers.

Re-envisioning School Systems

For decades now, there has been a growing push away from traditional visions of school as training ground for the child's intellectual skills, leading to masterly of the required subject matter. A paradigm shift has occurred in which new conceptions of schools and schooling have emerged, including learner-centered education (Henson, 2003), and child-friendly education for all (UNICEF, 2010). These models, notwithstanding some differences, envision school systems where each child's needs (physical, emotional, social, physiological, and cognitive) take center stage. Indeed, many countries have embraced these approaches as reflected in national education policies. Within these new visions of schooling, teachers are viewed not just as masters of content, but all those aspects that encompass children's overall development (Baker, 2006; Horowitz, Darling-Harmmond, Brandsford, et al., 2005). These aspects may include the ways in which teachers interact with children, how they design learning experiences, their sensitivity and responsiveness, the feedback they give to students, and the everyday decisions that they make. Therefore, scholars and practitioners increasingly view the teacher-student relationship as a key variable in the context of a child's overall development (Baker, 2006).

Another key aspect of these new visions of school systems is the availability and provision of counseling and guidance to students, an issue that is now enshrined in many national education policies (Okech & Mimemia, 2012; Okocha & Alika, 2012; Richards, Zivave, Govere, Mphande, & Dupwa, 2010; Stockton et al., 2010; Uganda Ministry of Education & Sports, 2005). Through its Kenya National Youth Policy (KNYP), for instance, the Ministry of Home Affairs, Heritage, and Sports (2002), called for establishment of counseling and guidance units in all school institutions. Similarly, the government of Uganda through its Government White Paper of 1992 endorsed an earlier Education Policy Review Commission to place two guidance counselors in each school (Government of Uganda, 1992). The policy directive also required the education ministry to train *senior man/woman teachers* and peer educators in basic counseling skills to carry on the important role of guidance in the school system. A decade earlier, the Nigerian government had recognized the importance of counseling and guidance and, as such, enshrined it in its National Policy on Education of 1981 (Okocha & Alika, 2012). The government pointed to the ubiquitous nature of personality maladjustment and ignorance about career prospects among many young people as key influences in developing the policy. Similar sentiments were echoed in the establishment of counseling and guidance policies in many other countries such as Zimbabwe (Richards et al., 2010), Malawi (Maluwa-banda, 2007), and Zambia (Ministry of Education, 2001).

A repeated theme across many countries, however, is the paucity of professionally trained personnel to carry out the role of counseling and guidance, even in countries where governments mandate their existence. Okocha and Alika (2012), for instance, estimated the student-to-counselor ratio to be 1000:1 in many Nigerian secondary schools where professional counselors exist. Earlier studies in Nigeria had revealed low numbers of professional counselors in schools (e.g., Gesinde, 2008; Alutu, 2005), or no counselors at all (Alao, 2009). The dearth or absence of professional counselors in schools is a constant theme through many surveys and studies across Africa. Owino and Odera (2014), Songok, Youngungu, and Mulinge (2013), and Okech and Mimenia (2012) all lamented the situation in Kenyan schools; while similar situations have been noted in Malawi (Maluwa-Banda, 1998), Zimbabwe (Nkala, 2014), Tanzania (Biswalo, 1996), and Botswana (Stockton et al., 2010), Nigeria (Nweze & Okolie, 2014), and Namibia (Mushaandja, Haihambo, Vergnani, & Frank (2013).

Role of Teachers in Counseling and Guidance

In the absence of trained professionals in counseling and guidance or/and national policy requirements, teachers have become central to the provision of counseling and guidance services in their respective countries (Musaandja et al., 2013; Nyamaka, Ondima, Nyamwange, Ombaba, & Magaki, 2013). In many countries, teachers are called upon to act as counselors for their students, along with their teaching role, although there is limited guidance in policy documents about how to meet these roles in tandem. This is the case in Zimbabwe where, as Nkala (2014) noted, teachers are assigned counseling and guidance roles, in spite minimal training in the provision of such services. Kamau, Wachira, and Thinguri (2014) reported that, in Kenya, the responsibility of appointing teacher counselors is left to school principals who rely on their own discretion in making such appointments. A similar practice exists in both Tanzania and Uganda, where head teachers in primary and secondary schools appoint *senior men/women* or *career masters/mistresses* to the roles of counselor and guidance teachers, in addition to their usual teaching responsibilities, often without any additional compensation (Biswalo, 1996; Senyonyi et al., 2012).

Several surveys from various countries have reported two major challenges that teachers face as counseling and guidance providers, including lack of training in the requisite skills and the lack of resources to support their services. In many instances, governments are providing teachers with materials but not the vital training needed to carry out the roles and functions of counseling and guidance. For instance, the majority of teacher participants in Nyamwaka and colleagues' (2013) study reported receiving either inadequate training or no training at all to implement the counseling and guidance program as required by the government. In their study evaluating challenges counseling and guidance services provided in Namibian schools, Mushaandja et al (2013) found lack of suitable space, time, appreciation and acknowledgement of the teacher-counselor roles as some of the major challenges of teacher counselors in the country. Other notable challenges identified in the study included lack of understanding of scope of practice as well as legal and ethical issues related to the para-professional work performed by teachers. Nkala (2014) reported a lack of both qualified teachers and material resources as key challenges in some secondary schools in Bulawayo province. Of the 30 teachers who participated in the study, 67 percent reported no training in counseling and guidance. Similar training and resource constraints have been reported in

Uganda (Uganda Ministry of Education, 2005), Botswana (Sexton et al., 2010), and Malawi (Maluwa-banda, 2007).

Towards a 'Whole-School' Approach to Counseling and Guidance

Because of the many challenges that plague current efforts to provide counseling and guidance in schools, several authors have questioned the efficacy of prevailing approaches and practices, and consequently called for reorientation of such efforts (Kamau et al., 2014; Nyamwaka et al., 2013; Mushaandja et al., 2013). For some of these authors, such reorientation will require clarifying the guidance counselor's roles and responsibilities; appointment of full-time teacher counselors; integrating counseling and guidance into the larger mission of each school system; and providing mandatory pre-service and in-service teacher training in counseling and guidance (Nyamwaka et al., 2013; Songok, Yungungu, & Mulinge, 2013). Others have called for a 'whole school approach' to counseling and guidance (Aluede, Imonikhe, & Akpaida, 2007). Such an approach has been described as a systems oriented, collaborative endeavor between guidance counselors, teachers, school management, and other members of the school community with identified counselors overseeing the planning and delivery of identified services (Aluede et al.; Hui, 2002; Watkins, 1994).

A whole school approach is rooted within larger theories of human development, which tend to view development as: (a) multidimensional, (b) plastic/malleable, and (c) contextual, (d) a gain-loss dynamic, (e) constitutive of both nature and nurture, and f) lifelong (Berk, 2010). More importantly, the model has found much support within more contemporary ecological frameworks particularly that advanced by Bronfenbrenner (2005), which have drawn attention to the power of ecological forces in child development. According to Bronfenbrenner's ecological model human development is a processes nested within a set of interrelated environments, which include microsystems (settings where the person routinely participates); mesosystems (relationships among those settings); exosystems (settings in which primary caregivers of the child routinely participate); macro systems (broader societal level beliefs, values, practices, etc.); and chronosystems (effects of time over the life course).

These and other assumptions has become the cornerstone of a comprehensive developmental model of counseling and guidance, which has received wide cross-cultural attention (Aluede et al., 2007; Gysbers & Henderson, 2000; Hui, 2000; Watkins, 1994). In the United States, the comprehensive counseling and guidance approach has received widespread acceptance, and variations of the model have been adopted both nationally and locally (Sink & McDonald, 1998). The American School Counselor Association endorsed the approach most notably through the ASCA National Model (ASCA, 2003). Within Africa, this approach influenced the development of several a Training Package used for training personnel at the Guidance Counseling and Youth Development Center for Africa in Lilongwe, Malawi (UNESCO, 2000).

Underling comprehensive counseling and guidance approach are is a set of philosophical assumptions, best articulated by Green and Keys (2001), that include: (a) developmental counseling must be suffused through the entire educational process and aligned with school's mission and philosophy, (b) all students are in need of developmental counseling and guidance, (c) teachers are a vital component of program delivery system, (d) program success requires effective integration of and focus on student cognitive and affective development, (e) inclusion of both individual and group counseling, program evaluation means, and consultation, and (f) focus on student assets. Watkins (1994) opined that such an approach encompasses the process and content of teaching and addressed the in inherent interface between counseling and guidance and the general purpose of education. Accordingly, teaching is viewed as "providing a planned and systematic progression of learner-centered experiences to enable learners to acquire knowledge, skills, and competencies related to making personal, educational, and career decisions and transitions" (Watkins, 1994, p. 144).

It is on the basis of these assumptions that Gysbers and Henderson (2000) proposed a Comprehensive Guidance Program model, also referred to as the Missouri Model, which consists of four key components: guidance curriculum, individual planning, responsive services, and system support (Table 1). While emphasizing that a comprehensive guidance program must be responsive to local contexts, Gysbers and Henderson underscored that it must be able to offer students opportunities to develop competencies in the three domains of academic development, career development, and persona/social development. Although each component is important, I will focus mainly on the guidance curriculum dimension because it requires that counseling and guidance initiatives be integral to any school's academic mission and, thus, requiring the direct participation of teachers in the process. Several dimensions of the guidance curriculum component have been put forth, including that it must include developmentally appropriate student competencies, guidance classroom activities, and educationally-focused classroom presentations (ASCA, 2003; Gysbers & Henderson, 2000). There are indications within the literature that, when designed and implemented properly, these and similar components generally have a positive impact on student overall development (Aluede et al., 2007).

Notwithstanding the reported benefits, some have questioned the comprehensiveness of Gysbers and Henderson's model as it is, noting that it needs to be redefined to incorporate more programs that address impediments to learning (Adelman & Taylor, 2001). These authors thus proposed six areas for inclusion: (a) class-based interventions, (b) direct services to students and their families, (c) crisis intervention, (d) supportive transition, and (e) family involvement in schooling, (f) community outreach.

Incorporating Counseling and Guidance Into Teacher Training Curriculum

A key feature of the comprehensive counseling and guidance approach is that it requires the collaboration and participation of an entire school community and requires integration throughout the entire school curriculum (Aluede et al., 2007; Hui, 2000). It calls for proactive, preventive, and developmental strategies as opposed to the remedial and reactive attitudes that characterize traditional approaches (Hui, 2000). Within this approach, teachers are viewed as integral in that their perceptions of the guidance and their role in it may have significant implications for the provision, implementation, and success of guidance services (Hui, 2007). Thus the emphasis on a guidance curriculum within the Comprehensive Guidance Program model suggests teachers' need to be familiar with any proposed curriculum materials that they will be called upon to implement. Such familiarity should begin in during pre-service teacher training and continue throughout a teacher's tenure in form of in-service training workshops. The proposed model does not aim to supplant but rather to supplement current teacher training curricula practices, as well as teacher roles and functions. As Aluede and colleagues (2007) noted, because of their daily interactions with students teachers are well placed to identify students in need of counseling and guidance services and to make appropriate interventions or/and referrals. The Uganda Ministry of Education (2005) noted in its *Tutors Guide for Guidance and Counseling for Primary Teacher Colleges*,

> When every teacher has been updated with knowledge, skills and positive attitudes towards Guidance and Counseling, every child will have chance to be listened to and given the most appropriate help necessary for self-development through enhancement of academic, social, mental development and discipline.

Conclusion

It has been noted that many a student, regardless of academic ability, may encounter some emotional, behavioral, and developmental challenges from time to time (UNESCO, 2001). Although, ideally, such challenges should be addressed by specialists with the requisite professional training and skills, teachers are often at the frontline of identifying and monitoring at-risk students, supporting them in addressing their challenges, and coordinating support for them within and outside schools.

Table 1: Comprehensive Counseling and Guidance Model (Gysbers & Henderson, 2000)

School Guidance Curriculum Provides guidance content in a systematic way to all students	Individual Planning Assists students in planning, monitoring, and managing their personal and career planning	Responsive Services Addresses the immediate concerns of students	System Support Includes program, staff, and school support activities and services
Purpose	Purpose	Purpose	Purpose
Student awareness, skill development, and application of skills needed in everyday life	Student educational and occupational planning, decision making, and goal setting	Prevention and intervention	Program delivery and support
Areas Addressed	Areas Addressed	Areas Addressed	Areas Addressed
Academic Motivation to achieve Decision-making skills Goal setting Planning Problem-solving skills *Career* Awareness of educational opportunities Knowledge of career opportunities Knowledge of career/technical training *Personal/Social* Self-esteem development Interpersonal effectiveness	*Academic* Acquisition of study skills Awareness of educational opportunities Appropriate course selection Lifelong learning Utilization of test data *Career* Knowledge of career opportunities Knowledge of career/technical training Need for positive work Habits *Personal/Social* Development of	*Academic* Academic concerns Physical abuse Sexual abuse Emotional abuse Grief, loss, and death Substance abuse Family issues Sexual issues Coping with stress Relationship concerns School-related concerns: Tardiness, absences and Truancy, misbehavior, School avoidance, drop-out prevention	*Academic* Guidance program development Parent education Teacher and administrator consultation Staff development for educators School improvement planning Counselor professional development Research and publishing Community outreach Public relations

Communication skills Cross-cultural effectiveness Responsible behavior	healthy Self-concept Development of adaptive and adjustive social behavior		
Guidance Counselor role Structured groups Consultation Guidance curriculum implementation	Guidance Counselor role Assessment Planning Placement	Guidance Counselor role Individual counseling Small-group counseling Consultation Referral	Guidance Counselor role Program development and management Consultation Coordination

In other words, teachers are essential to identifying those “critical incidents’ to students’ personal, social, career, and academic experiences (Best, 1999). If schools are to train students for life (UNESCO, 2007) then counseling and guidance content and academic content must be viewed as two complementary components, which should have their places in pre- and in-service teacher training. This may enable teacher trainees to link academic content with counseling and guidance standards. Blending counseling lessons into academic content begins with all teachers being familiar with national counseling and guidance policies. While the establishment of the Guidance Counseling and Youth Development Center for Africa, and subsequent Training Package (UNESCO, 2000) is a step in the right direction, the related training curriculum ought to be infused within teacher training curriculum throughout the region. This is more so because of the well-documented challenges facing the development of professional counseling across the continent, particularly those with the requisite skills in counseling and guidance.

References

Adelman, H., & Taylor, L. (2001). *Framing new directions for school counselors, psychology, and social workers.* Los Angeles, CA: Center for Mental Health Schools.

Ager, A., Akesson B., Stark, L., Flouri, E., Okot, B., McCollister, F., & Boothby N (2011). The impact of the school-based Psychosocial Structured Activities (PSSA) program on conflict-affected children in northern Uganda. *Journal of Child Psychology and Psychiatry, 52*(11), 1124–1133.

Alao, I. F. (2009). Counselling and Nigerian national policy on education: The question of relevance and competence. *The Nigerian Journal of Guidance and Counselling, 14,* 134–141.

Aluede, O., Imonikhe, J., & Afen-Akpaida, J. (2007). Towards a conceptual basis for understanding developmental counseling and guidance model. *Education, 128*(2), 189-201.

Alutu, A. N. G. (2005). The status of guidance services in secondary schools in Edo state. *The Nigerian Journal of Guidance and Counselling, 10,* 114–125.

American School Counselor Association. (2003). *The ASCA National Model: A framework for school counseling programs.* Alexandria, VA: Author.

Baker. J. A. (2006). Contributions of teacher-child relationships to positive school adjustment during elementary school. *Journal of School Psychology, 44,* 211-229.

Berk, L. E. (2010). *Exploring lifespan development (2nd ed.).* Boston, MA: Allyn & Bacon.

Barna, J. S., & Brott, P. E. (2011). How important is personal/ social development to academic achievement? The Elementary School Counselor's Perspective. *Professional School Counseling, 14.*

Barry, M. M., Clarke, A. M., Jenkins, R., & Patel, V. (2013). *A systematic review* of the effectiveness of mental health promotion interventions for young people in low and middle income countries. *BMC Public Health, 13*, 835.

Biswalo, P. M. (1996), *An introduction to guidance and counselling in diverse African contexts.* Dar Es Salam, Tanzania: Dar Es Salaam University Press.

Brigman, G. A., Webb, L D., & Campbell, C. (2007). Building skills for school success: Improving the **academic** and **social** competence of students. *Professional School Counseling, 10,* 279-288.

Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development.* Thousand Oaks, CA: Sage Publications.

Chireshe, R. (2011). School counsellors' and students' perceptions of the benefits of school counseling and guidance services in Zimbabwean secondary schools. *Journal of Social Sciences, 29*(2), 101-108.

Dimmitt, C. (2003). Transforming school counseling practice through collaboration and the use of data: A study of academic failure in high school. *Professional School Counseling, 6*(5), 340-349.

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1), 405-432.

Gesinde, A. M. (2008). *Guidance and counselling in institutions of learning.* Ibadan, Nigeria: Foludex Press.

Green, A., & Keys, S. (2001). Expanding the developmental school counseling paradigm: Meeting the needs of the 21st century students. *Professional School Counseling, 5,* 84-95.

Horowitz, F. D., Darling-Hammond, L., & Bransford, J. (2005). Educating teachers for developmentally appropriate practice. *In Preparing teachers for a changing world: What teachers should learn and be able to do*. L. Darling-Hammond & J. Bransford (eds.), 84-125. San Francisco: Jossey-Bass.

Hui, E. K. P. (2002). A whole-school approach to guidance: Hong Kong teachers' perceptions. *British Journal of Guidance & Counselling, 30*(1), 63-80.

Kamau, G. W., Wachira, I. N., & Thinguri, R. (2014). Factors considered in the appointment of guidance and counselling personnel in public secondary schools in Kenya. *Asia Pacific Journal of Multidisciplinary Research, 2(*1), 37-41

Kieling, C., Baker-Henningham, H., Belfer, M., Conti, G., Ertem, I., Omigbodun, O., Rohde, L. A., & Srinath, S. (2011). Child and adolescent mental health worldwide: Evidence for action. Lancet, 378:1515–1525.

Kiweewa, J. M., & Luke, M. (2011). *The interface of human development theories, curriculum, and instructional methodologies: Letting what we know inform what we do.* Presented at the International Conference on Education Conference, Nairobi, Kenya.

Lee, C. D. (2010). Soaring above the clouds, delving the ocean's depths: Understanding the ecologies of human learning and the challenge for education science. *Educational Researcher, 39*(9), 643-655.

Maluwa-Banda, D. W. (1998). School counsellors' perceptions of a guidance and counselling programme in Malawi's secondary schools. *British Journal of Guidance & Counselling, 26*(2), 287-295.

Mghweno, P. E., Mghweno, L. R., & Baguma, P. (2014). Access to counseling and guidance services and its influence on students' school life and career choices. *African Journal of Counseling and guidance, 1*(1), 7-15.

Mushaandja, J., Haihambo, C., Vergnani, T., & Frank, E. (2013). Major challenges facing teacher counselors in schools in Namibia. *Education Journal, 2*(3), 77-84.

Nkala, P. P. (2014). An assessment of the guidance and counselling programme in secondary schools at Mzilikazi district in Bulawayo Metropolitan province. *Journal of Humanities and Social Science, 19*(1), 81-90.

Nweze, T., & Okolie, U. C. (2014). Effective guidance and counselling programmes in secondary schools: Issues and roles in students; career decision making. *Journal of Research & Methods in Education, 4*(1), 63-68.

Nyamwaka, E. O., Ondima, P. C., Nyamwange, C., Ombaba, S., & Mkagaki, E. K. (2013). Assessment of implementation levels of guidance and counselling programme in Kenyan secondary schools: A case of Sotiki district, Bomet county, Kenya. *Journal of Education and Practice, 4*(3), 178-186.

Okech, J. E., & Kimemia, M. (2012). Professional counseling in Kenya: History, current status, and future trends. *Journal of Counseling & Development, 90*(1), 107-112.

Okocha, A. A. G., & Alika, I. J. (2012). Professional counseling in Nigeria: Past, Present, and Future. *Journal of Counseling & Development, 90* (3), 362-366.

Owino, J., & Odera, F. Y. (2014). Guidance and counselling practices by teachers in primary schools in Kisumu west sub county, Kenya. *International Journal of Academic Research and Reflection, 2*(4), 89-99.

Parker, J. D. A., Creque, R. E., Barnhart, D. L, Harris, J. I.., Majeski, S. A., Wood, L. M., & Hogan, M. J. (2004). **Academic achievement** in high school: Does emotional intelligence matter? *Personality and Individual Differences, 37,* 1321 -1330.

Peled, E., Jaffe, P. G., & Edleson, J. L. (Eds.). (1995). *Ending the cycle of violence: Community responses to children of battered women.* Thousand Oaks, CA: Sage.

Richards, K. A. M. Richards, Zivave, A. T., Govere, S. M., Mphande, J., & Dupwa, B. (2012). Counseling in Zimbabwe: History, current status, and future trends. *Journal of Counseling & Development*, *90*(1), 102-106.

Rivet-Duval, E., Heriot, S., & Hunt, C. (2011). Preventing adolescent depression in Mauritius: A universal school-based program. *Child and Adolescent Mental Health, 16*(2), 86-91.

Senyonyi, R. M., Ochieng, L. A., & Sells, J. (2012). The development of professional counseling in Uganda: Current status and future trends. *Journal of Counseling & Development, 90,* 500- 504.

Ssewamala, F. M., Neilands, T. B., Waldfogel, J., & Ismayilova, L. (2012). The impact of a comprehensive microfinance intervention on depression levels of AIDS-orphaned children in Uganda. *Journal of Adolescent Health, 50*(4), 346-352.

Smith, E. A., Palen, L. A., Caldwell, L. L., Flisher, A. J., & Graham, J. W. (2008). Substance use and sexual risk prevention in Cape Town, South Africa: An evaluation of the HealthWise Program. *Preventative Science, 9,* 311-321.

Songok, A., Yungungu, A., & Mulinge, P. (2013). Factors that militate against effective guidance and counselling on students' sexual awareness, attitude, and behavior in schools. *American International Journal of Social Science, 2*(8), 109-114.

Stockton, R., Nitza, A., & Bhusumane, D. (2010). The development of professional counseling in Botswana. *Journal of Counseling & Development, 88,* 9-12.

Uganda Ministry of Education & Sports. (2005). *Tutor's guide: Guidance and counselling for primary teacher colleges*. Kampala, Uganda: Author.

UNESCO. (2000). *Regional training seminar on counselling and guidance.* UNESCO: Author

UNESCO (2002). Terms of reference: The first international conference on guidance and counselling and youth development in Africa. Nairobi, Kenya. Author.

Watkins, C. (1994). Whole-school guidance? *British Journal of Guidance and Counselling, 22*(1), 144-150.

Zambia Ministry of Education. (2001). Training teachers in counseling skills: A training manual. *Curriculum Development Center*, Lusaka, Zambia.

QUALITY EDUCATION UNDER THREAT IN TEACHER TRAINING COLLEGES: A CASE STUDY OF NAIROBI COUNTY, KENYA

Kisilu Kombo
Kenyatta University
jnkiisiilu@gmail.com

Annah Jepketer
Kenyatta University
yegon_ann@yahoo.com

Quality of education, which manifests itself in many forms, has remained elusive. School administrators, teachers, students, parents and education stakeholders have complained of falling standards. Hence the need for investigation of the state of affairs and the mitigating factors. One of these forms of concern under threat includes teachers' preparation in training colleges. The questions emerging here were: Why tutors are not able to train competent teacher trainees? Could there be a problem with their teaching methodologies and competencies in their areas of specialization? The purpose of the study was to investigate the strategies for enhancing teacher educator competencies so as to improve the quality of education in teacher training colleges in Nairobi County. Resistance and Change Theory guided the study. The study used case study design. The researcher used 10% as population sample size for education policy makers, teacher educators and teacher- trainees. The target sample was 10 education policy makers, 1 teacher training college, 1 teacher training college principal, 10 teachers and 50 teacher trainees. A simple random sampling technique was employed in the study. Questionnaires were administered to education policy makers, teacher educators, teacher trainees while the college principal was interviewed. Document analyses on key education policies were undertaken. The study findings were: despite of the availability of the qualified teacher educators, teacher competencies remained elusive; traditional teaching methods were in use; monitoring of quality of teaching by quality assurance was low and far between; teacher educators were hardly exposed to professional development and research opportunities for improving their teaching methodologies; insecurity impacted negatively on the teachers level of preparedness; in addition, insecurity affected them psychologically, economically and socially; The conclusion drawn from this result was that education quality in teacher training colleges in Nairobi County was under threat due to waning competencies. Therefore, urgent measures should be put in place in order to reverse the trend. Some of the recommendations were that stakeholders to be pro-active in coming up with workable solutions; stakeholders to be proactive in addressing issues touching on competencies and of quality education in teacher training colleges; in servicing teachers on teaching methodologies; teachers to embrace e-learning; the teachers to be part of the changes; Quality and standards assessment of quality to education should be strengthened and corrective strategies for enhancing teacher competencies in teaching to be enhanced; adequate proactive strategies ought to be developed to effectively address security challenges in teacher training colleges.

Key words: Teacher Education, Education Quality, Competences, Threat

> The education in Kenya provided to Kenyan students' must be quality and relevant to address the challenges facing the society such as respect to human rights, drugs and substance abuse, violation and social exclusion (Cabinet Secretary, Ministry of Education Science and Technology, February, 2015).

Introduction

Quality education that manifests itself in many forms has remained elusive. School administrators, teachers, students, parents and education stakeholders have complained of falling standards. Globally, teacher issues in teacher education have continued to attract world attention and quality of education relating to teacher preparation in the 21st century is under threat. According to Darling Hammond (2012), a high quality system of learning and teaching for developing teachers should be well grounded, coherent and consist of high quality curriculum materials and assessments.

Education is an investment in human capital and a key determinant of economic growth of a country (RoK, 2005). Quality of education therefore is the degree under which education is considered to be of a high standard, satisfies the basic needs pertaining to learning while enriching learners experience (RoK, 2010). Teacher education is a foundation of any established system, a launch pad for economic progress and a custodian of culture of a given society. Teacher education prepares teachers for the society, equips teachers with necessary skills and competences required for the achievement of goals of the education system (Kafu and Simwelo, 2015). Successful implementation of teacher education curriculum, involves acquisition of knowledge in a subject area and pedagogical skills by the teacher trainee enabling him/her to be an effective imparter of knowledge influencing all aspects of education (RoK, 2012). This view was strengthen by the Sessional paper No. 6 of 1988 on Education and Manpower Training for the Next Decade and Beyond that laid emphasis for Kenya on the need for developing and promoting teacher education programmes in Kenya (RoK, 1988).

Kenya is a signatory to international commitments in education including the Millenium Development Goals (MDGs) and Education for All (EFA) goals, which emphasizes provision of quality education. Goal 3 of the Dakar framework EFA goals is to enhance education access and promote quality education while Goal 6 calls for improving all aspects of quality education by promoting excellence for all to achieve measurable learning outcomes especially in literacy, numeracy and life skills' (UNESCO, 2000). The Kenya's Basic Education Act of 2013 section 4 reiterates the government commitment to provision 'of quality and relevant' education to meet national objectives (The Laws of Kenya, 2013).

This paper sets out to discuss the status of education quality in teacher training including the challenges and the strategies for enhancing teacher competencies to improve quality of education in teacher training colleges in Nairobi County.

Status of Education Quality in Teacher Training Colleges in Kenya

Provision of quality education and training requires that people involved possess the capacities and skills commensurate to the tasks they undertake. The existence of gaps between competencies and responsibilities of those assigned to undertake education provision has been documented (RoK, 2005). One wonders whether teacher educators (tutors) have the necessary competences to prepare teacher trainees for primary school classrooms.

The socio-economic challenges of the 1960s saw Kenya struggled to attain self-rule and became independent in 1963. The Sessional Paper No. 10 of 1965 identified national developmental challenges as poverty, disease and ignorance. These issues were regarded as vices that needed eradication, if the country was to realize its developmental goals (GoK, 1964). Today the same concerns still exist in the society, despite the paper outlining the key national educational objectives, priorities and strategies. Despite the several education committees, commissions and presidential working parties that were formed to address various challenges in different levels of education and training including teacher quality of education in teacher training remains under threat (RoK, 2010).

Kenya has continued to show tremendous progress in promoting access to education. According to Kenya Economic survey (2011), the evidenced based data showed that teacher trainee enrolments in teacher training have been increasing.

The teacher trainees' data disaggregated by gender, in teacher training colleges are summarized in Table 1.

Table 1: Teacher Trainees Enrollment by Year and Sex from 2006-2010

TYPE OF INSTITUTION / CERTIFICATION	2006		2007		2008		2009		2010	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Public Primary Teachers (P1)										
First Year	4201	4589	4621	4435	4134	3908	4121	4313	4579	4763
Second Year	4589	4334	4201	4589	4601	4402	4260	3944	4233	4175
Sub Total	**8790**	**8923**	**8822**	**9024**	**8735**	**8310**	**8381**	**8257**	**8812**	**8938**
Private Primary Teachers (P1)	**1474**	**1586**	**1524**	**1599**	**2672**	**2702**	**3453**	**4231**	**4353**	**4287**
Sub Total	**10,264**	**10,509**	**10,346**	**10,623**	**11,407**	**11,012**	**11,834**	**12,488**	**13,165**	**13,225**
Diploma Teachers										
First Year	359	295	422	301	452	204	365	322	460	328
Second Year	301	261	359	295	403	297	445	198	361	311
Third Year	344	287	301	261	358	293	385	287	441	175
Sub Total	1004	843	1082	857	1015	794	1195	807	1262	814
TOTAL	**11,268**	**11,352**	**11,428**	**11,480**	**12,422**	**11,806**	**13,029**	**13,295**	**14,427**	**14,039**
GRAND TOTAL	**22,260**		**22,908**		**24,228**		**26,324**		**28,466**	

Source: Kenya Economic Survey, 2011,pp. 53

As shown in Table 1, data indicates that in primary teacher training colleges, teacher trainee enrolment rose from 22,620 in 2006 to 28,466 in 2010 representing 20.5 percent increase. The enrolment in 3 Diploma teacher-training colleges rose from 1,847 in 2006 to 2,076 in 2010 representing 11.03 percent increase. In the private primary teacher training colleges' student enrolment rose from 3,060 in 2006 to 8,460 in 2010 representing 65.9 percent increase. Kenya has continued to collaborate with the private sector institutions with the aim of opening up and creating opportunities for students to pursue teaching career while encouraging lifelong learning.

The number of teacher training educational institutions, critical for accelerating quality and access to education increased between 2006 and 2013 and the trend of the expansion are summarized in Table 2.

Table 2: The number of Teacher Training Colleges in Kenya from 2006 to 2013

Institutions	Years							
	2006	2007	2008	2009	2010	2011	2012	2013
Number of Teacher Training Colleges (Pre Primary)	30	33	96	71	121	122	125	131
Teacher Training Colleges (Primary)	30	33	96	105	110	112	118	123
Teacher Training Colleges(Secondary)	3	3	3	3	3	3	3	3

Source: (Kenya Economic Survey, 2011,pp. 53 & MOEST, 2015)

Table 2 indicates that the number of Teacher Training Colleges in Kenya increased from 30 in 2006 to 131 in 2013 in Pre Primary representing 77.6 percent increase. During the same period the number of teacher training institutions rose from 30 in 2006 to 123 in 2013 in Primary representing 75.6 percent increase. There was no increase of establishment of Diploma Teacher Training Colleges stagnated during the period remaining at three and included Kibabii, Kagumo and Kenya Technical Training College.

Despite Kenya's commitment to carrying out monitoring and quality assessments in educational institutions, education reports indicate the shortage of required staff. The shortage of Quality Assurance and Standards officers was estimated at 745 in 2008 and 721 in 2009. Although the officers carried out quality assessments by covering training colleges the number of assessments increased from 181 in 2008 to 339 in 2009 and falling to 243 in 2010 (RoK, 2010).

Teacher Educator Competences and Teacher Preparation

In teacher training, teacher educators are significant resources in teaching and learning processes. Despite Kenya showing progress in its continued pursuit to quality education in teacher training colleges, the WEF (World Education Forum) in Dakar, Senegal noted that countries of the world continue to face challenges in defining the meaning, purpose and the content of basic education in contextually fast changing world. The Forum noted that Sub Saharan Africa continued to focus on easy to reach targets yet quality is very important in education endeavors (UNESCO, 2000).

The aim of teacher education programme in Kenya is for developing professional attitudes, communication skills and values by equipping teachers with knowledge and ability to identify education needs of the learners (RoK, 2005). However, teacher educators have not been able to train competent teacher trainees for the classroom (RoK, 2012). However, teacher educators have not been able to train competent teacher trainees for the classroom (RoK, 2012).

The research evidence and literature synthesis has displayed capacity gaps by tutors relating to teachers' competences in Kenya. The education report assessing the achievement of EFA goals noted the lack of proper teacher preparation in teacher education, teacher educators are resistant to change their instructional practices and the impact of teacher training in teaching of learners is questionable (RoK, 2010). In addition, the Education Taskforce report on the alignment of education to the Constitution of Kenya 2010 found out that teacher training faces enormous challenges. There is; limited harmonization and accreditation of programmes in in-service (INSET) education and training, confusion over minimum qualification of teacher entry grades, overemphasis on capacity development on certain subject areas and limited funds hindering access to INSET programs.

The report further noted that teacher training in pedagogy is in doubt and there is lack of follow-up of pre service teachers after beginning their teaching to assess their mastery in pedagogy and content (RoK, 2012). In addition, poor teacher preparation is evident in primary schools where teachers use transmission teaching making learners to be passive. In addition, teachers lack opportunities for in-service to allow for continuous skills upgrading (RoK, 2005).

Other evidenced- based research shows that teacher education continues to experience challenges hindering effective preparation of teachers in Kenya. Kafu (2011) noted that limited funding and resources for teacher education programmes constraints effective teacher preparation in teacher training colleges in Kenya. In addition, Wafula (2012) explained in a research paper that the teacher poor mastery of the subject matter (Oral literature), negative attitudes towards the subject, inadequate learning materials and resources that hampers achievement of teacher quality.

Therefore, achieving quality education in teacher training requires real change in pursuit for excellence to built necessary teacher competences. A competency goes beyond knowledge and skills to having ability to meet complex society demands (OECD, 2005). It is the ability to perform complex acts with ease, precision and adaptability (EU, 2013). Teachers should be concern with damning education reports and research evidence indicating their teaching inadequacies.

Teacher competencies in teaching entail acquisition of tacit and explicit knowledge, cognitive and practical skills that involve motivation, value orientation, beliefs and emotions. In addition, teacher competences involves; equipping teachers with the ability to meet complex demands teachers acting appropriately and professionally; teachers thinking reflectively, undertaking tasks efficiently and effectively; wider systemic views on teacher professionalism on multiple levels (individual, the school, the local community including the professional networks (EU, 2013; OECD, 2005).

Today's teachers need to be prepared to provide technology supported learning opportunities for the students (UNESCO, 2008). According to European Commission, the roles and expectations for teachers are changing as they; teach in multicultural classroom environment, integrate with students with challenges (special needs), and adapt to use of ICT in teaching. Teachers should strive to; acquire essential competences to enhance their effectiveness in the classroom and raise students' achievement and take initiatives of developing teaching competences in the fast changing (EU, 2013).

As Barber and Mourshed (2007) noted, the best performing school systems are those that continues to remain focused and improving instruction in three areas including; getting the right people to become teachers; developing them into effective instructors and ensuring systems and targeted support are put in place for children to benefit from 'excellent instruction' resulting in improved learning outcomes.

Strategies for Improving Teacher Competences in Teacher Training Colleges

Despite the issues that underpin the achievement of quality education in teacher training colleges, Kenya has formulated education policies and legislative framework in furtherance of education objectives in the country.

Implementation of Education Policies to improve the Provision of Education Quality

The Sessional Paper No. 14 of 2012 on reforming education and training sector in Kenya provide for continuous education reforms at all levels of education to meet the education quality standards. The policy on teacher management aims at ensuring persons entering teaching service fulfils all the requirements such as having necessary qualifications, registration, recruitment and being maintained through deployment, promotion and discipline (RoK, 2012).

Establishment and Implementation of Legislative and Institutional Frameworks to Improve the Provision of Education Quality

In the efforts to address quality assurance in learning institutions, Ministry of Education Science and Technology, through the Basic Education Act of 2013 and Technical Vocational Education and Training Act of 2013, has established Education Standards and Quality

Assurance Council (ESCAC) in the institutions of basic education and Technical Vocational Education and Training Authority (TVETA) in Science and Technology. The aim of the institutions is to administer education policies and guidelines relating to quality education, oversee and supervise curriculum implementation, evaluate and monitor standards and quality in basic and tertiary education (RoK, 2012/2013). In addition, the Kenya ICT educational strategy developed in 2006, guide the integration of ICT into education (RoK, 2006). However, effective education policies must be clear, coherent, provide direction on what is to be implemented both in the short term, medium, and long term by the institutions involved.

Other institutions charged with promoting quality of education include; Kenya Institute of Curriculum Development that deals with developing national curricular for all levels of education except the university. The Kenya National Examination Council that deals with setting, maintaining standards and conducting national examination for school and post-school institutions excluding the universities. In addition, Teachers Service Commission that deals with to ensuring high standards of education and training for teachers entering the service, facilitating professional development and career progression for teachers monitoring the conduct and performance of teachers in the teaching service (RoK, 2012; The Laws of Kenya, 2012). MOEST continues to address the education quality by coordinating capacity-building programmes of education managers at Kenya Education Management Institute, Centre for Mathematics, Science Technology in Education (CEMASTEA) (MOEST, 2015).

Professional Learning and Teacher Competences

Strengthening teacher educator competencies is a matter of commitment by the stakeholders involved. Professional skills and knowledge enhances teacher quality in teacher training enabling students to achieve high quality education. By identifying their weak teaching areas and attaining particular competency standards, teachers apply professional knowledge and skills to facilitate learning (Government of Western Australia, 2004). Sanyal (2013) posited that an effective teacher needed in the classroom can only be developed by quality professional preparation resulting from quality career long professional development.

Capacity Building with ICT Skills to Enhance Teacher Competences

Research evidence continues to show the importance of teachers' pedagogical and content knowledge in improving students' learning outcomes. Stoop (2011) has shown that effective teachers have comprehensive pedagogical and content knowledge of subject matter and the learning process that influences student achievement. In addition, Kong, Miao and Lee (2009) explained that teachers requires technology resources to be able be to work with colleagues in a technologically supported instructional environment. Providing lifelong teacher preparedness and professional development, which includes structured opportunities for retraining, upgrading and acquisition of new knowledge and skills in-service, will build teacher competences (Kong, Miao & Lee, 2009).

Other strategies for enhancing teacher competences include enhancing professional growth of teachers through teacher retraining and encouraging benchmarking for best practices and embracing research and emerging technologies in education (RoK, 2005)

Resistance and Change Theory

Resistance Theory

Resistance theory was founded on the ideals of scholars that include Henry Giroux (1983). According to Giroux, resistance in education is weighted toward a highly technocratic rationality relying on logic from natural sciences. Resistance theory looks at education as being controlled by the state. For instance, development of education policies without the control of parents and teachers and provision of rules to follow in its implementation. According to Giroux the state imposes power on production of truth and knowledge about education. The emphasize is on expertise through certification, curriculum development and professionalism with dominant ideology of separation of knowledge from power. Teachers are left to implement while schools are regarded as instruction sites where learning process is controlled.

Resistance theory links the display of behavior to the interest it stands for and goes beyond the interest that underlies its hidden logic. The implication of this theory is to indicate that the education laws and policies guide education and serve the interests of the state. The learning institutions embrace what the state and priorities of the policy dictates and implement the curriculum as dictated by the state. Sometimes teacher may resist and may change their minds with clarification of the policy.

Change Theory

The social scientist and contemporary theorist, Kurt Lewin in 1947, advanced the Change theory. The life of Lewin involved solving social conflict among the disadvantaged or minority groups. He believed that the permeation of democratic ideals into the society as a whole could assist solve social conflict and that learning was a sure way of enabling individuals to understand and restructure their perceptions of the world they live. Lewin therefore developed 3-step model of change referred to Unfreezing, Moving (Change) and refreezing. In unfreezing, the stability of human behavior is a result of a quasi-stationary equilibrium, which is supported by a complex field of driving and restraining forces. In the second state of change or moving, an individual is ready to take into account all forces at work and choose from all the available options. In this stage, without reinforcement, the change may not last. The third step is refreezing stage, which involves groups trying to stabilize, accept change and behaviors becomes the norm. With regard to organization, refreezing imply changes occur in organization culture, policies, practices and norms (Burns, 2004).

In the teacher training, it implies that teacher educators are resistant to change when new ideas for improving teaching are introduced. For instance, the emergent use of Information and Communication Technology as a preferred mode of instruction delivery in teaching was initially resisted, yet with emphasis by government on the need to embrace modern teaching methods, teachers have no option but to accept and adopt (RoK, 2013). Sometimes there are threats could arise out of teacher resistance to teacher education policies which is expected to be implemented without questioning. However, as teachers move along, they are able to accept the change by adapting to new teaching methodologies and working together in groups to create synergy.

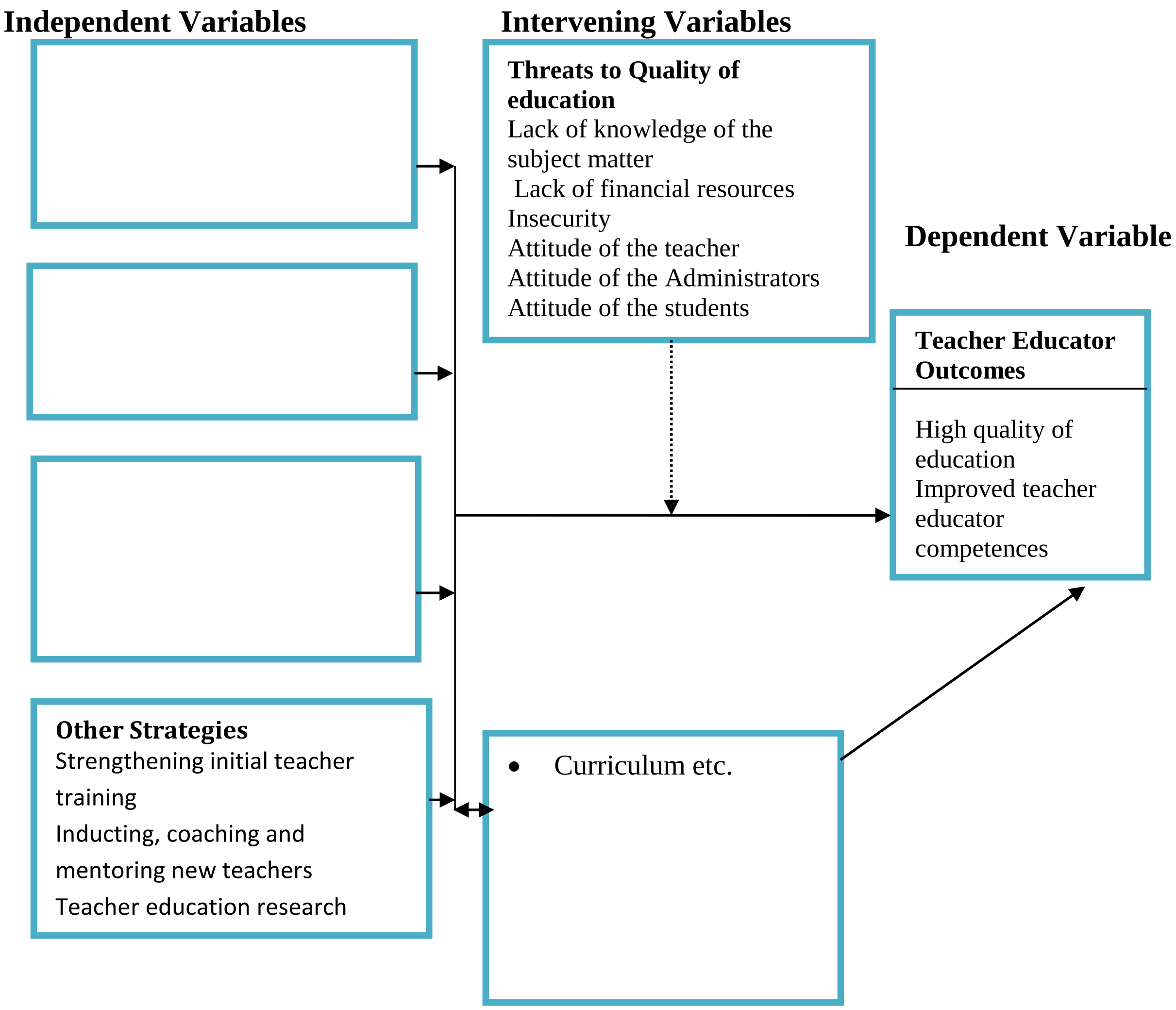


Figure 1: Conceptual Framework on the Strategies for Enhancing Teacher Educator Competencies in Teacher Training Colleges

Figure 1 shows how the independent variables interact to result in education outcomes of high education quality and improved teacher educator competences. The independent variables are the strategies aimed at improving teacher competences shown in framework. Acquisition of these teacher competences results in high quality education and improved teacher competences. Teacher educators are confident and willing to adapt changes resulting to high quality of education outcomes. However, as indicated by the intervening variable, there are threats to achieving teacher quality that includes; lack of knowledge of the subject matter, lack of financial resources, insecurity, attitude of the teacher, attitude of the administrators and attitude of the students.

Research Problem

Quality of education in teacher training colleges in Kenya is elusive. Tutors have not been able to train competent teacher trainees threatening the very foundation of furthering societal culture and values. Teacher educators are resistant to change instructional practices in their teaching, and the impact of teacher training in teaching of learners is questionable (RoK, 2010). Stakeholders in education sector have decried the quality of teacher preparation in teacher training colleges.

Despite Kenya government continued support to education sector through resource allocation, teacher issues relating to education quality continue to be the point of concern as documented by educationists, research scholars and stakeholders. The problem emerging is whether tutors have problems relating to their teaching methodologies and competences. The issue is whether tutors are adequately prepared to bring changes in teaching approaches, to prepare competent teacher trainees for classroom practice and beyond. Evidence-based research indicates lack of proper teacher preparation or training. Majority of teacher educators have been documented to lack Trainer Education Qualification (RoK, 2010/2012; Kafu, 2011).

In addition, government-planning document indicates that Kenya has low learning outcomes for pupils in national examination due to non-attainment of the desired reading and numeracy competences (RoK, 2008). Evidence based research has shown that 2 out of every 3 pupils are deficient of actual literacy and numeracy skills and; fails to pass the basic tests in English, Kiswahili and numeracy set at standard two level. The quality of education at the foundation level is low (Uwezo East Africa, 2012). Limited quality assessments in basic educational institutions and few quality assurance and standards officers have meant other institutions escape unchecked (RoK, 2010).

Research Objectives

The purpose of the study was to investigate the strategies for enhancing teacher educator competencies to improve the quality of education in teacher training colleges in Nairobi County.

The specific objectives were to:

1. Establish the status of teacher education and teacher educator in teacher training in Kenya
2. Establish the strategies for enhancing teacher educator competences in TTCs in Nairobi County.
3. Examine the threats to quality of education in teacher training colleges in Nairobi County.

Research Question

The following were the research questions that guided the study:

1. What is the status of teacher education and teacher educator in teacher training in Kenya
2. How can teacher competences be enhanced to meet the teacher education objectives in Nairobi County?
3. What are the threats to quality of education in teacher training colleges in Nairobi County?

Methods

The researcher employed a case study design. Case study design was appropriate to the study as it involves carrying out contextual analyses of issues under investigation and relating to similar organizations (Sekaran, 2010). Data collection was done by use of questionnaires, interviews and document analysis. The researcher analyzed education policies, related legal documents and literature synthesis related to the area of study. The researcher used 10% as population sample size for education policy makers, teacher educators and teacher- trainees. The target sample was 10 education policy makers, 1 teacher training college, 1 teacher training college principal, 10 teachers and 50 teacher trainees. The Director of teacher training college was interviewed on the areas as stated in the research questions. Interviews are more flexible and assist in capturing in-depth information for the study (Kombo & Tromp, 2011). Questionnaires were administered to teacher educators and teacher trainees. The questionnaires were appropriate for the study as it allowed time for respondents to gather relevant information sought by the researcher, it was easy to administer and allows for reaching larger number of respondents (Kombo & Tromp, 2011). Data analysis was done using frequencies, percentages and content analysis. Data presentation was done through use of tables.

Findings

The data were collected from 6 males and 3 females among the education policymakers and 5 males and 5 females for the teacher educators and 46 teacher trainees with 24 males and 22 females.

Strategies for Enhancing Teacher Competences in Teacher Training Colleges

Professional Development of Teacher Educators and Teacher Competences

The variable considered the academic, professional teacher training and the experience of teacher educators. Education policymakers and teacher educators provided information on their highest academic qualifications, experience and professional teacher training.

Academic qualifications of teachers. The researcher sought to find out the highest academic qualifications, professional teacher training and experience from the education policy maker and teacher educator respondents. The respondents were further required to indicate the level of their education attainment.

Table 3: Academic Qualifications of Education Policy Makers and Teacher Educators Respondents

Statement	Responses			
Academic qualifications for the Teachers	**Frequency**	**Percent (%)**	**Frequency**	**Percent (%)**
Primary teacher Certificate (P1)			4	44.4
Diploma in Education	-	-	-	-
Bachelor of Education (Primary)			1	11.1
Bachelor of Education (Science)	1	10		
Bachelor of Education (Arts)	1	10	1	11.1
Masters Degree in Education	8	80	3	33.3
Total (N=10)	**10**	**100**	**9**	**100**

Table 3 shows majority (80%) of the education policymakers indicated they had Masters Degree in Education, (10%) had Bachelor of Education Science Degree while (10%) had Bachelor of Education Arts degree. As shown in Table 1, majority (44.4%) of the teacher educator respondents had Primary Teacher Certificate (P1), while (33.3%) had Masters Degree in Education. The findings from the study indicated that both the education policymakers and teacher educators in teacher training colleges have high academic qualifications. This enhances reliability of data as it was collected from highly qualified respondents who have hands-on-experience in education policy relating to teacher training. Most teachers had the minimum qualification, Primary teacher certificate needed for one to enter teaching profession, as they are trained teachers.

Teaching experience in teacher training colleges in Nairobi County. The respondents who were the policy makers and teacher educators were asked to provide information of their teaching experiences in teacher training. Table 4 shows the summary of the findings.

Table 4: Teaching Experience of the Respondents

Statement	Responses			
	Policy makers (N=9)		Teacher educators (N=10)	
	No.	Percent	No.	Percent
Less than a year	-	-	-	
1-5 years	3	33.3	1	10
6-10 years	1	11.1	3	30
11-15 years	5	55.5	5	50
20+ years	-	-	1	10
TOTAL	**9**	**100**	**10**	**100**

Table 4 shows that majority (55.5 %) of the education policy makers and majority of the teacher educators (50%) had experience of teaching at teacher training colleges. Teaching experience assists teachers to strengthen their teaching skills and to improve their teacher trainees learning outcomes.

Teaching methodologies in teacher training colleges in Nairobi County. The respondents who were the policy makers and teacher educators were asked to rate the statement on the teaching approaches used by teachers in teacher training using a Likert scale. Table 5 shows the summary of the findings.

Table 5: Teaching Methodologies in Teacher Training Colleges

Statement	Responses										
		Policy makers (N=9)					Teacher educators (N=10)				
		SD	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**
Discussions	Frequency		**4**	**1**	3	1	2	3	3	1	1
	Percentage (%)		44.4	11.1	33.3	11.1	20	30	30	10	10
Lecture	Frequency				2	7			1	2	7
	Percentage (%)				22.2	77.7			10	20	70
Role Play	Frequency		4		3	6		4	2	2	2
	Percentage (%)		44.4		33.3	66.6		40	20	20	20
Groups	Frequency		5	1	2	1		3	3	2	2
	Percentage (%)		55.5	11.1	22.2	11.1		30	30	20	20
Individually	Frequency				2	7				1	9
	Percentage (%)				22.2	77.7				10	90
ICT tools	Frequency		5	1	1	2		4	3	1	2
	Percentage (%)		55.5	11.1	11.1	22.2		40	30	10	20

As shown in Table 5 majority of the education policy makers and majority of the teacher educators indicated the use of variety of teaching approaches to enhance teaching and learning in teacher training colleges. The ratings were high for use of lectures and individualized teaching; majority (77.7%) of the policy makers indicated that majority of teacher educators use lectures and employ individualized teaching. In addition, majority (70%) of the teacher educators indicated that they use lecture and prefer to teach individually (90%). In addition, the findings from policymakers indicated that other teaching approaches such as discussions (10%), role-play (44.4%), working in groups (55.5%) and use of ICT tools (55.5%) in teaching seems not to be frequently used by teachers. These responses, agreed with responses of teacher educators that indicated discussions (20%), role play (40%), working in groups

(30%) and use of ICT tools (40%) in teaching seems not to be frequently used by teachers as strategies for improving teaching in the classrooms.

Instruction Practices for Enhancing Teacher Competences in Teacher Training Colleges in Nairobi County

The respondents who were the policy makers and teacher educators were asked to rate the statement on the instruction practices for improving teacher competences using a Likert scale. Table 6 shows the summary of the findings.

Table 6: Instruction Practices for Enhancing Teacher Competences According to the Policy Makers and Teacher Educators

Statement	**Responses**									
	Policy makers (N=9)					Teacher educators (N=10)				
	SD	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**
Content knowledge			1	1	7			3	1	6
			11.1	11.1	77.7			20	10	70
Instructional materials				4	5			1	3	6
				44.4	55.5			10	30	60
Evaluation and feedback				1	8				2	8
				11.1	88.8				20	80

Table 6 shows that majority (88.8 %) of the education policy makers and majority of the teacher educators (80%) agreed and strongly agreed that content knowledge is one of the strong instructional practices improving teaching in teacher training colleges. Majority (99.9 %) of the education policy makers and majority of the teacher educators (90%) indicated that instructional materials are one of the strategies for enhancing teacher competences. Majority (99.9 %) of the education policy makers and majority of the teacher educators (100%) agreed and strongly agreed that teacher evaluation and feedback is one of the strategies for enhancing teacher competences.

Capacity Building of Teacher Educators on ICT Skills to Enhance Teacher Competences

The respondents who were the policy makers and teacher educators were asked to rate the statement on whether ICT knowledge and skills improves teacher competences in teacher training colleges using a Likert scale. Table 7 shows the summary of the findings.

Table 7: Capacity Building of Teacher Educators on ICT Skills According to Policy Makers and Teacher Educators

Statement	**Responses**										
		Policy makers (N=9)					Teacher educators (N=10)				
		SD	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**
ICT content Knowledge and skills	Frequency				3	6			1	2	7
	Percentage (%)				33.3	66.6			10	20	70
Use of technology resources	Frequency			1	1	6				4	6
	Percentage (%)			11.1	11.1	66.6				40	60

Table 7 shows that majority (99.9 %) of the education policy makers and majority of the teacher educators (90%) agreed and strongly agreed that ICT content knowledge is one of the strong strategies for improving teacher competences in teacher training colleges. Majority (66.6 %) of the education policy makers and majority of the teacher educators (60%) indicated that use of technology resources enhances teacher educator competences.

Other Strategies for Enhancing Teacher Competences

The respondents who were the education policy makers and teacher educators were asked to identify the strategies for enhancing teacher competences, which in turn would result in improved teacher trainees learning outcomes. The strategies that the study investigated included; strengthening initial teacher training, inducting, coaching and mentoring of new teachers and teacher education research. Table 8 summarizes the findings of the study.

Table 8: Capacity Building Strategies for Enhancing Students Performance

Strategies Identified	**Responses**					
	Education policy makers		Teachers Educators (N=83)		Teacher Trainees (N=46)	
	No.	Percent	No.	Percent	No.	Percent
Strengthening Initial teacher training	7	77.7	9	90	40	86.9
Inducting, coaching and mentoring of new teachers	8	88.8	7	70	39	84.7%
Teacher education research	8	88.8	6	60	42	91.3%

Table 8 shows that majority (77.7 %) of the education policy makers, (90%) of the teacher educators and (86.9%) of the teacher trainees respondents indicated that strengthening initial teacher education programmes would enhance teaher competences. In addition, the findings has show that majority (88.8 %) of the education policy makers, (70%) of the teacher educators and (84.7%) of the teacher trainees respondents indicated that induction, coaching and mentoring improve teacher competences of new teachers. The results of the findings further indicate that majority (88.8%) of the education policy makers, (60%) of teacher educators and majority of the teacher trainees (90%) indicated that teacher education research enhances teacher competences.

Teacher Competences in Teacher Training Colleges in Nairobi County

The respondents who were the policy makers and teacher educators were asked to rate the statement on whether teacher competences are needed by teachers in teacher training using a Likert scale. Table 9 shows the summary of the findings.

Table 9: Types of teacher competences teachers should acquire to improve teaching

Statement	**Responses**										
		Policy makers (N=9)					Teacher educators (N=10)				
		SD	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**
Knowledge competences	Frequency				**5**	**4**				**5**	**5**
	Percentage (%)				**55.5**	**44.4**				**50**	**50**
Methodological Competences	Frequency				2	7				4	6
	Percentage (%)				20	70				40	60
Technical competences	Frequency				4	5				1	9
	Percentage (%)				44.4	55.5				10	90
Disposition competences	Frequency				3	5				3	7
	Percentage (%)				37.5	62.5				30	70
Traversal competences	Frequency				1	6				4	6
	Percentage (%)				14.3	85.7				40	60
Institutional competences	Frequency				1	7				2	8
	Percentage (%)				12.5	87.5				20	80

Table 9 shows that majority of the education policy makers and majority of the teacher educators indicated the different variety of competences needed for teachers to acquire in order to improve teaching in teacher training. The competences included knowledge, methodological, technical, disposition, traversal, and institutional competences. The ratings were high above (55.5%) for all the competences tabulated implying stakeholder awareness of the need for teacher to have these capabilities in teaching to be regarded as highly competent.

Threats to Education Quality in Teacher Training Colleges

The respondents who were tutors and teacher trainees were asked to state whether there were threats and state the threats to teacher education and training. Table 10 summarizes the findings.

Table 10: Policy Makers, Tutors and Teacher Trainees Responses to Existence of Threats to Quality Education in Teacher Training Colleges

Existence of threats to quality education in teacher training	**Responses**					
	Policy makers (N=9)		Teacher educators (N=10)		Teacher Trainees (N=46)	
	No.	Percent	No.	Percent	No.	Percent
Yes	8	88.8	8	80	40	86.9
No	1	11.1	2	20	6	13.04
Threats to quality education in teacher training						
Lack of knowledge of the subject matter	5	55.5	4	40	35	76
Lack of knowledge on instructional practices	6	66.6	5	50	38	82.6
Limited financial resources	6	66.6	7	70	35	76
Poor infrastructural facilities	5	55.5	6	60	36	78
Insecurity due to terrorist like activities	6	66.6	8	80	40	86.9

Table 10 shows that majority (88.8 %) of the education policy makers and majority of the teacher educators (80%) and majority (86.9%) of the teacher trainees indicated existence of threats to quality education in teacher training. The threats indicated in the study that were rated highly by the respondents include lack of knowledge of the subject matter, the policy makers (55.5%), tutors (40%) and teacher trainees (76%); Lack of knowledge on instructional practices indicated by the majority (66.6 %) of the education policy makers and teacher educators (50%) and majority (82.6%) of teacher trainees; Limited financial resources indicated by the majority (66.6 %) of the education policy makers and teacher educators (70%) and majority (76%) of teacher trainees. Poor infrastructural facilities indicated by the majority (55.5 %) of the education policy makers and teacher educators (60%) and majority (78%) of teacher trainees. Insecurity due to terrorist like activities indicated by the majority (66.6 %) of the education policy makers and teacher educators (80%) and majority (86.9%) of teacher trainees.

The Principal of teacher training was asked to state the threats facing education quality in teacher training colleges and ways of addressing. The following are summary of the qualitative responses; lack of knowledge of the subject matter, most tutors do not prepare lesson plans unless they are constantly supervise, the duration of the practicum is short yet teacher trainees requires repeated practice. In addition, the teacher education curriculum needs review In addition it was noted that there were shortage of teachers and emerging insecurity poses a threat to training in TTCs.

Discussions

The strategies for improving teacher competences are widely discussed in research literature Darling Hammond (2012) has shown that professional development of teachers and learning opportunities relating to teaching ought to be linked to evaluation system.

The findings has revealed that professional development remains important strategies in building on teachers' knowledge, skills and attitudes hence improving teacher competences. In addition, strengthening initial teacher training, inducting, coaching and mentoring of new teachers and carrying out teacher education research enhances acquisition of teacher competences. The findings indicated that both the education policy makers and the tutors have the necessary qualifications, experiences, and professional education and training.

The findings of the study on teaching approaches have revealed that teacher educators have skills and knowledge gaps in preparation of teachers' as they do not apply adequately the use of variety of teaching methodologies such as role-play, discussions, groups and ICT skills. Bridging the gap between inadequate teaching competences and knowledge and skills for the tutors will require interventions to be undertaken through professional learning. Tutors are encouraged to acquire professional attitudes and behaviors to improve teaching.

This emphasis on professional development is confirmed by research reports that have laid emphasis on building instructional capacity for learning institutions through provision of instructional resources such as; instructional content knowledge, instructional materials, instructional relationships and organization structures that support identification, development and the use of instructional resources (Jaquith, 2012).

The findings have indicated that instructional practices by teachers such as content knowledge, instructional materials and teacher evaluation and feedback improve teacher competences. Improving teacher educators' instructional practices by technology-supported solutions will assist teachers adapt to changing global demands. Teacher educators are required to adopt to change by upgrading teaching skills and knowledge to suit current ICT technologies. As noted in the UNESCO strategy for teachers, technology solutions are a powerful strategy for improving teaching. Using ICTs will improve literacy in learning and traversal themes such as HIV/AIDs, Education for Sustainable Development and ICT mainstreaming.

Supporting beginning teachers through follow up after entering teaching profession will build their teaching competences that include; technical competences consist of communication tools, word processing, presentation tools, spreadsheet, web publishing, and social networking. The methodological competencies include; instructional competences, planning processes, pedagogical knowledge, content knowledge, classroom management and knowledge of students. Finally, the dispositions competences consists of; reflection, willingness to learn as well as innovate, emphasis on values, beliefs and interpersonal relationships (Lim, 2009). Teacher competencies should be continuously refined to suit the changing classroom practice.

Education is a catalyst for change requiring constant review to evaluate its relevance to societal needs and demands. The advent of globalization and knowledge economy requires teachers to embrace new learning approaches. Teachers are encouraged to be innovative by using teaching approaches more appealing to the learners, enhance learning environment, and encourage technology literacy, knowledge deepening and knowledge creation (UNESCO, 2008).

As established from the findings, effective implementation of education policies, adhering to relevant education legislations, will create enabling environment for teacher preparation. In addition, undertaking teacher professional evaluation, professional improvement and scaling up teacher educator and college initiatives will improve teacher competences and quality teaching in teacher training colleges (UNESCO, 2012).

The findings has shown the threats to quality of education in teacher training college as lack of adequate skills and knowledge, uncoordinated capacity development in-service education and training programmes, poor ICT and physical infrastructure, shortage of teachers and financial resources. In addition, insecurity is considered the emergent threat to education sector.

Conclusion and Recommendations

From the findings of the study, it can be concluded that despite teacher education programme being given support by government through existing policies and legislations, tutors in teacher training colleges have not been able to train competent teacher trainees. The research reports on teacher quality have called for continued assessment of the contribution of teacher educators in preparing teacher trainees in teacher training colleges (RoK, 2010). Contextual and other critical teacher issues contribute to poor preparation of teacher trainees. Limited knowledge on subject matter, limited funding to provide instructional resources, inadequate ICT and physical facilities, and emerging challenges related to insecurity threatening safety in teacher training colleges.

The recommendations were that stakeholders to be pro-active in coming up with workable solutions; stakeholders to be proactive in addressing issues touching on competencies and of quality education in teacher training colleges; in servicing teachers on teaching methodologies; teachers to embrace e-learning; the teachers to be part of the changes; Quality and standards assessment of quality to education should be strengthened and corrective strategies for enhancing teacher competencies in teaching to be enhanced; adequate proactive strategies ought to be developed to effectively address security challenges in teacher training colleges.

References

Barber, M. and Mourshed, M. (2007). *How the World best-performing School System come out on the Top, McKinsey and Company. (Online)* Available at: http://www. McKinsey.com/ Retrieved on; 11.06.2015

Burnes, B.(2004).*Managing Change. 4th Edition*. Prentice Hall, Pearson Education Limited.

Giroux, H. (1983).*Theories of Resistance and Reproduction in the New Sociology of Education: A Critical Analysis.* Havard Educational Review (Online) Available at: www.academia.edu/3638580/ Retrieved on; 11.06.2015

Jaquith,A. (2012). *Building Instructional Capacity.* (Online). Available at: https://cset.standford.edu/ Instructional-capacity.pdf Retrieved on; 16.06.2015

Kafu, P.A. (2011). *Teacher Education in Kenya: Emerging Issues.* International Journal of Curriculum and Instruction 1 (1), 43-52. (On-line) Available at; http://www.mu.ac.ke/ijci/articles/Vol1/kafufulltext. Retrieved 15.6.2015

Kafu, P.A., and Simwelo,G.N. (2015).*Reforms and Innovations in Teacher Education. (*Online). Available at; http://www.eajournals.org/journals/british-journal-of-education..../.pdf. Retrieved 15.6.2015

Kombo, D.K. & Tromp, D.L.A. (2011). *Proposal and Thesis Writing*: An Introduction. Nairobi: Paulines Publication Africa.

Kong, W., Miao, F., and Lee, M. (2009). Capacity Building for ICT in Education. (Online). Available at; www.digital-renew.org/uploads/files/pdf/2009-2010../ Retrieved on; 16.06.2015

Lim, C. (2009).*Capacity Building of Teacher Education Institutions:* A Paper presented during the Regional Workshop in Integrating ICT in Education in SEAMEO member countries from 2-3 June 2009. Bangkok. (Online). www.academia.edu/1657449/..../ Retrieved on; 16.06.2015

OECD (2005). *The Definition and Selection of Key Competences*. (Online). Available at; www.oecd.org/pisa/35070367.pdf Retrieved on; 16.06.2015

Republic of Kenya, (2012). *Economic Survey, 2011:* Kenya National Bureau of Statistics. Nairobi: Government Printer.

Republic of Kenya, (2012). *Education for All-End of Decade Assessment: 2001-2010*. Ministry of Education. Nairobi: Kenya.

Republic of Kenya, (2015). *Reforming the Education Sector in Kenya.* Public Lecture delivered by Prof. Jacob Kaimenyi, Cabinet Secretary, Ministry of Education, Science and Technology. (Online) Available at: www.education.go.ke/home/images/cs-speeches/education-reforms-in-kenya.pdf / Retrieved: 13.06.2015

Republic of Kenya, (2012). *Sessional Paper No. 14 of 2012 on Reforming Education and Training Sectors in*

Kenya. Nairobi: Ministry of Education & Ministry of Higher Education, Science and Technology.

Republic of Kenya, (2012). *Report of the Taskforce on the Re-Alignment of Education Sector to the Constitution of Kenya 2010:* Towards a Globally Competitive Quality Education for Sustainable Development. Ministry of Education. Nairobi: Kenya.

Republic of Kenya (2007).Strategic Plan 2007-2012: Science, Technology and Innovation for National Prosperity and Global Competitiveness. Nairobi. Ministry of Science and Technology.

Republic of Kenya (2010).*Quality Index: Guidelines for Quality Assurance and Standards Assessment of Schools in Kenya.* Nairobi: Ministry of Education.

Republic of Kenya (2006). *National Information and Communication Technology (ICT) Strategy for Education and Training*. Nairobi: Ministry of Education.

Republic of Kenya, (2008). *Strategic Plan, 2008-2012:* Towards a Competitive and Prosperous Kenya

Republic of Kenya, (2005). *Sessional Paper No.1 of 2005 on Policy Framework for Education, Training And Research*. Nairobi, Government Printer.

Republic of Kenya (1988). Sessional paper No. 6 of 1988 on Education and Manpower Training for the Next Decade and Beyond. Nairobi: Government Printer.

Sanyal, B.C., (2013). *Quality Assurance of Teacher Education in Africa: Fundamentals of Teacher Education Development 5*. Addis Ababa. UNESCO-International Institute for Capacity Building in Africa (Online) Available at: unescodoc.unesco.org/images/0022/002292/229200e.pdf
Retrieved on: 03.05.2015

Sekaran, U. (2010). *Research Methods for Business.* A Skill Building Approach, 4th Edition. Carbondale: John Wiley and Sons.

Stoop, G. (2011). *Evaluation Indicators for School Reviews.* Education Review Office, New Zealand. (On-line) Available at; http://www.ero.govt.nz/review-process/Frameworks-and-evaluations. Retrieved on; 10.08.2013.

The Laws of Kenya, (2012). *The Basic Education Act No. 14 of 2013*. Nairobi: Government Printer.

The Laws of Kenya, (2012). *Teachers Service Commission Act No. 20 of* 2012. Nairobi, Government Printer.

UNESCO (2008). *ICT Competency Standards for Teachers. Policy Framework.* United Nations Educational Scientific and Cultural Organization. (Online). Available at: www.unesco.org/images/0015/0015562..E.pdf
Retrieved on; 16.06.2015

THE TASK-BASED LANGUAGE LEARNING AND TEACHING (ACTIONABLE PERSPECTIVE) OF FRENCH IN SECONDARY SCHOOLS IN KENYA

Leonorah C. Lutiali
Kenyatta University
lutialicl@yahoo.com

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

French is an official language of the AU, COMESA, UN and other international organization (KIE, 2002). Dewey's educational theory (1902) states that the major flaw in instructional methodology is the inactivity of the learner. The Actionable perspective (TBLT), which is the focus of this study is assumed to be a more effective approach in French language acquisition. TBLT emphasizes learning by accomplishing various tasks by the learner. This learner-centered method will lead to the integration of the learner in the world community and make him/her a social actor (Rosen, 2009). The Engestrom Activity Theory (1987) shows how a wide range of factors work together to impact a task. Understanding the teacher's role as one of these factors is essential in successful learning. Moreover, Hughes (2013) posits that instructional materials development is based on the learner's needs. According to Sam (2014), integrating ICT in instructional methodology increases enrollment in the academic program. The objectives of this research are to find out teacher preparedness in using TBLT. In addition, it will look at other instructional methods used in teaching French, the instructional materials used and the behavior of the learner. The research will be descriptive and will be conducted in seventeen (17) secondary schools offering French in Nairobi County. Teachers in these schools will answer to a questionnaire on their understanding of TBLT. A lesson observation guide will be used to observe form three students in the French class to find out the learner attitude, motivation and success in performing various tasks. Purposive sampling will be used to administer a student written composition to sixty-eight (68) form three students in each of the schools. The three instruments of data collection; questionnaire, lesson observation guide incorporating Flanders interaction matrix and student test will be tested during the pilot study to ascertain validity and reliability. Data will be analyzed using the SPSS computer package and presented in tables and graphs. The research will be of benefit to curriculum developers and teachers, as it will bring out what should be considered as content in the French curriculum.

Key words: Methodology, Task-Based Approach, Learner, Curriculum

Introduction

French is the second international language after English and is used as a medium of communication in the UN and COMESA regions. The language also facilitates access to varied information in areas such as education, tourism, science, trade, technological research and international relations. In the learning/teaching of any language, methodology, which plays a vital role, keeps evolving with time. This is why Dewey posits that if we teach our children today the way we taught them yesterday, we deprive them of tomorrow. Some of these methods of instruction include traditional, direct, audio-visual, problem-based, project-based, communicative language teaching and recently, Task-Based Approach.

The Task-Based Approach originates from Dewey's view about the importance of experience for effective learning (Ellis, 2009). It emphasizes purposeful and functional language by using real-life tasks in the classroom. Moreover, it is learner-centered as it focuses on effective use of the target language by allowing the learner to play the role of carrying out manipulative and communicative tasks. The main objective of the research is to test TBLT in the French classes. Other objectives include; finding out which methods are used in teaching French, instructional materials, teacher/learner interaction in class and testing performance before and after TBLT instruction.

In Kenya, there are three universities and two diploma colleges that train teachers of French (Keya, 2008). These include; Kenyatta, Maseno and Moi universities and Kagumo and Kibabii teachers' colleges. The Ministry of Education recommends teaching of French at secondary school level, thus a child is expected to begin learning French in form one, at fourteen years of age. This is a disadvantage because language is fast acquired at a younger age. Moreover, only some secondary schools and a few private primary schools offer French as an optional subject. These institutions are few considering that with globalization, there is a high demand for people who can communicate in multiple languages. However, French is also offered at the French Cultural Center in major towns; thus Nairobi, Mombasa, Kisumu and Eldoret to any person who is willing to learn. On successful completion of the course, 'DELF' and 'DALF' certificates are offered to the candidates that enable them to compete effectively on the international job market.

In the Kenya Institute of Curriculum Development (KICD) syllabus, French is lamped together with technical subjects such as; Agriculture, Music, Woodwork, Home Science and Art which makes it very challenging to teach the language. Moreover, there is need to change the KICD syllabus which was designed thirteen years ago because the methods proposed in this syllabus have not experienced change over a long period of time.

The Kenya National Examinations Council (KNEC) was established in 1980 and is mandated to prepare and mark examinations and then offer certificates to successful candidates. It is evident that we cannot talk of learning/teaching without evaluation. In French, students are expected to sit for three examination papers that incorporate the four language skills of listening, reading, writing and speaking. According to the reports by KNEC, the performance of French has been minimal. In addition, the total candidature has been very low as this is an optional subject.

The learning/teaching exercise requires instructional resources to be effective. KICD has recommended four titles for use in secondary schools. However, the production of teaching resources has been a big challenge as publishers argue that the French market is small and so this makes it uneconomical for their business. Some schools cannot afford basic instructional aids like a radio that is crucial in teaching listening skills. The French cultural centre has intervened by inaugurating twenty French Resource centers in both universities and schools and encouraging students to visit the Cultural centers near them where they have access to films, French international radio (RFI.89.9 FM), comics, journals and internet.

Previously, teachers of French in Kenya used to undergo an in-service course in teaching French immediately after leaving college and once they start teaching. The teachers would be sponsored to stay in France (*stage linguistique*) for a month to enable them master French. This was the initiative of the Ministry of Education and the French Embassy as continued teacher training plays an essential role in any learning situation. Nowadays, these courses are very rare and so most of the teachers may not be informed of the new trends in French teaching.

Moreover, the Teachers Service Commission (TSC), which is charged with teacher deployment, offers very few slots for French teachers' employment. Some schools employ teachers on the basis of them being Francophone or immediately after secondary school without any formal training. This is detrimental to the delivery of content in French language acquisition. In 2010, the linguistic and Education office through the French Embassy organized a two-week training which was structured in the TBLT perspective. During this training, only around one hundred French teachers were in serviced and received their DALF certificates after sitting for the French examination.

The Engestrom Activity theory (Engestrom, 1987), which considers activity as the main element in language instruction, led scholars to develop the TBA. The proposed research will refer to it as the TBA theory. This theory has three elements; tools, subject and object. In the proposed research, tools are the instructional materials, the learner will be the subject and performing tasks to acquire language fluency and accuracy will be the object.

Statement of the Problem

The Mackay Report of Kenya (Mackay, 1981) reiterated fostering international consciousness among learners and teachers. In the proposed study, the researcher intends to teach form three students using TBLT, which has been recommended by the Common European Framework of References (Rosen, 2009). The Kenyan syllabus has not yet changed from the Communicative language teaching, a more ancient method than TBLT.

Additionally, reports from the national examination council raise several questions on the methods teachers use during French lessons. In the 2013 report, (KNEC report, 2013) it was noted that students had memorized some dialogues. This study on TBLT will help enrich the vocabulary of the learners to avoid presenting memorized dialogues.

Finally, some teachers in Kenya are using TBLT without clear guidelines or follow up. The proposed study will give clear guidelines on how to implement and effectively use this method.

Research Literature

In the United States of America, Ran (2013) in a report on ‘Responses from Chinese Teachers of English on TBLT’ posits that this method has been proposed by the current English curriculum in the USA since 2001. Although this research is on TBLT, the respondents were Chinese teachers of English. In the proposed research, the respondents are teachers and students of French.

Zhang (2000) in a research on ‘The application of TBLT in the Chinese classroom in China proposes that teachers should draw from various methods to adopt more suitable approaches to meet their specific teaching context. Although the above study was carried out in China, the proposed study will be done in Kenya and will consider other methods used in teaching/learning French.

Vogely (1995) in Spain in a research on ‘Perceived strategy used during performance on authentic listening comprehension tasks’ studied the strategies used and perceived by learners of Spanish on an authentic task. Although the above study was centered on Spanish students, the proposed study will have French students carrying out listening tasks.

Seetha (2004) researching on ‘A critical review of the Tamil language and syllabus’ posits that grammar teaching is not central in TBA because learners will acquire it as a by-product of carrying out tasks. He suggests introduction of activities such as drama and texts with approaches to oral language. Contrary to the above study, the proposed study will assess French language where teachers will respond to the question on which co-curricular activities their students participate in.

In South Africa, Adendorf (2006) on ‘Use of TBLT to acquire Afrikaans’ found out that students enjoyed task-based activities. Contrary to the South African study, in the proposed research, TBLT will be used during the lessons to acquire the French language.

Scarato (2014) in an article on Task-Based approach points out the fact that it is only after the task cycle that the learner’s attention is directed to language form. In the previous methods, a context for grammar teaching was to be invented while in TBA, it is already provided. Therefore, in the proposed study, the researcher will employ the TBA lesson structure where grammar is taught in context.

In a research on ‘Developing Task-Based writing with adolescents EFL students’, Cabral (2009) posits that in order for the students to write a letter for example, they have to be able to reactivate the letter structure, vocabulary and think of the problematic situations depending on their settings. In the proposed study, the researcher will teach and test writing skills where the student will be required to write a narration of a journey he/she had gone for.

Owuondo (2008) in a study on 'Instructional methods for composition writing in French' reiterates that TBLT was advanced to remedy the weaknesses that were found in the earlier methods. However, the research did not show the implementation and effectiveness of TBLT. Therefore, the proposed study seeks to show how TBLT can be used in teaching and its effectiveness through the test that will be administered to the students by the researcher.

According to Long (2004), one of the merits of TBA is that it encourages authenticity and gives provision for feedback and evaluation. Evaluation is a very vital element in any teaching/learning situation. The researcher in the proposed study will seek to evaluate, through a test the students in writing tasks.

In an article in the TESOL Quaterly, Richards (2012) writes that understanding the role of the teacher in methodology plays a major role in facilitating successful learning. In the proposed study, the researcher will assess teacher preparedness and role in the TBLT French lesson. The study seeks to find out the teacher's understanding of TBLT.

Chokah (2013) in a study on 'Training of French teachers in Kenya' found out that there has to be a balance between academic and professional training because a 'half-baked' teacher will lead to the beginning of a vicious circle; poorly taught learners who themselves become poor teachers later on. In the proposed study, the researcher will find out the level of both academic and professional training of the French teachers and their effect on the learner.

On 'Availability and use of learning/teaching materials', Kimui (1998) reiterates that resources represent a combination of materials, machines, facilities, environment as well as process and media programs. Although this study was carried out in primary teacher colleges in Kenya, the proposed study seeks to find out the instructional materials available in teaching French in secondary schools.

Comments

From the reviewed literature, it is clear that there is concerted effort by various scholars in quest to address TBLT. However, there is little research on this method in French in secondary schools in Kenya. The research literature, points to the fact that TBLT is a better method of teaching French because it is more learner-centered. It is therefore paramount that the KICD syllabus is revised to move from the communicative teaching approach to the task-based teaching.

Secondly, professional teacher training and in-service courses are very important tools for an effective teacher. A well-trained teacher leads to a well-taught learner who has an added advantage in the world community. All the teachers of French in Kenya need to undergo training in TBLT because this is the method that enables the learner to perform both manipulative and communicative tasks.

Thirdly, for TBLT to be successfully implemented in Kenya, the school administrators and the Ministry of Education have to provide the required resource materials. Having a good teaching method together with the necessary teaching resources will result to higher enrollments and improved performance in the French language.

Finally, because of modern technology, the Task-Based approach has the advantage of easy integration of ICT. Students can easily perform tasks on the computer using the Internet, which will make French learning and teaching more interesting in Kenya.

Methodology

The proposed study will be quasi-experimental. The researcher will use a questionnaire to collect data from the teachers of French. Quasi-Experimental design will be used to collect quantitative data and will be used to test the effectiveness of TBLT by subjecting the students to a test before and after teaching using TBA. Qualitative data will be sought using the questionnaire and a classroom observation protocol.

The research targets 20 teachers of French, 12 schools offering French and 180 form three French students in Nairobi County. Nairobi has been picked purposively because it has the highest number of schools (58) and the schools are of varied categories; thus mixed/same sex, day/boarding and private/public. The class of form three French students has been sampled purposively because the students have selected the subject and they have mastery of it.

The data collection instruments are; teacher's questionnaire, lesson observation guide incorporating Flanders's interaction analysis matrix and a student test. To assess validity, item inconsistencies and effectiveness will be assessed during pilot study. In addition, reliability will be ensured by triangulation and Spearman's formula for the pre-test and post-test results with a correlation coefficient of 0.8.

The researcher who will guide respondents for clarity then picked immediately to ensure that all the questionnaires are returned will administer the questionnaire. The researcher will make observations and comments using the lesson observation protocol during the French lesson. Prior to this, students will be advised to act normally and minimum time will be used.

Data collected from the respondents will be coded and analyzed using the Statistical Package for Social Sciences (SPSS). Data analysis will be carried out in two phases. The first phase will involve descriptive statistics where means, percentages and standard deviations will be obtained. In the second phase, inferential statistics (independent t-ratios) will be used to compare differences between means derived from the samples at 0.05-probability level (Mugenda & Mugenda, 1999).

Need for the study

The study is important because it will pave way for more research on the Task-Based Learning and Teaching both locally and internationally. In addition, it will help the curriculum designers in Kenya to change the French syllabus from earlier Communicative Learning and Teaching to the modern Task-Based Approach. Finally, from the new syllabus, the authors and producers of resource materials will know which type of content to include in the textbooks.

Conclusion

From the discussion above, it is clear that teachers who have undergone training in TBLT have students who are more creative and imaginative when it comes to carrying out tasks. Students who participate in co-curricular activities like drama and music have improved language mastery and this makes TBLT more effective.

Teachers of French use varied methods of teaching because they have students from different backgrounds. Some of the schools lack essential resources like Internet connection, radio and television and so teachers rarely use the audio-visual method. This is detrimental to carrying out the listening tasks in the French language task using TBLT.

In classes where there is effective teacher/student interaction, carrying out of tasks will be very successful as the teacher will be the mediator and the student, the social actor. Students will be motivated by the fact that they are the ones who are performing the tasks and not their teacher. The teacher's knowledge of his/her students background, attitude and behavior will enable him/her know how to give each student special attention.

In conclusion, there will be a significant difference in performance of the written test before and after teaching in TBA. This is because, after teaching in TBLT, the learner will be more accurate and fluent in the language because TBLT aims at acquiring both fluency and accuracy.

References

Adendorff (2006) Task-Based Approach in acquisition of Afrikaans. Stellenbosch University. South Africa
Cabral, M (2009) Developing Task-Based writing with adolescents EFL students. USA
Chokah,M,M. (2013) Training teachers of French in Kenya. International Journal of Education and Research. . Volume 1 No. 9.
Denorme, M.(2006) Compte rendu de l'experience:l'elaboration d'un curriculum dans le cadre d'un dispositive autonomisant, Memoire de Master 2, Lille 3
Dewey, J. (2009) Democracy and Education: An introduction to the philosophy of education. New York. WLC Books
Ellis, R. (2009). Task-based Language Learning and Teaching. New York: Oxford.
Engestrom, Y.(1987) Learning by Expanding. Helsinki, Orienta-Konsultit Oy.
Hughes, B(2010) Selecting a Task-Based Instructional Model.
Kenya Institute of Education.(2002). Secondary Syllabus Volume I. Nairobi, Kenya Institute of Education.
Kenya National Examination Council, (2007), Kenya Certificate of Secondary Examination report. Nairobi.
Keya, M, S(2009) Etudes des pratiques langagieres des enseignants Kenyans du FLE. Unpublished Master II thesis. University of Rouen, France
Kimui, V, W. (1998) A study of availability and use of the learning and teaching resources in primary Teachers colleges in Kenya. Unpublished Doctorate thesis. Kenyatta University. Nairobi
Mulama, H,S.(2008) Les écueils de l'enseignement du français a l'école primaire au Kenya. Unpublished Masters thesis. Kenyatta University. Nairobi
Mugenda, O & Mugenda, A. (2003). Research methods. Quantitative and qualitative approaches. Nairobi: Acts press.
Orwa, O, W.(1986) The study of organization and effectiveness of in-service education training and its role in teachers performance and primary schools achievement in national examinations in Kenya. Unpublished Doctorate thesis. Kenyatta University, Nairobi
Owuondo, E(2011) Instructional methods for composition writing in French in Secondary schools. Unpublished Masters thesis. Kenyatta University, Nairobi
Ran, H (2013) *TBLT.* Responses from Chinese Teachers of English. East Carolina University, USA
Richards, J.C(2012) Methodology in Language Teaching. TESOL Quaterly 20
Rosen, E. (2009) Perspective Actionnelle et approche par tache en classe de langue. Université de Lille
Scarato(2010) The Task-Based Learning Method: An overview.
Vogely, A (1995) Perceived Strategy used during performance on three authentic Listening Comprehension tasks. The Modern Language Journal, 79, 41-56
Wamuyu,R,W. (1996) Analyses de la mise en œuvre des pratiques pédagogiques de l'oral dans la classe de FLE. Unpublished thesis, Kenyatta University, Nairobi
Zhang (2000). *The application of TBLT in the Chinese classroom*. China.

SCHOOL MANAGEMENT'S AND TECHNICAL SUPPORT TO PHYSICS TEACHERS AND STUDENTS IN USE OF ICT IN TEACHING AND LEARNING

Makanda J. Livingstone
Kenyatta University
makandajohn@gmail.com

Nicholas W. Twoli
Kenyatta University
nicholastwoli@gmail.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Information and Communication Technology (ICT) is beginning to be recognised as one of the major instructional components especially in science subjects. This study sought to investigate the status of ICT in the teaching and learning of physics in secondary schools. Among other objectives, it investigated management's and technical support given to physics teachers and students. It was conducted in Kimilili District, Bungoma County, Kenya. A descriptive survey design was adopted. The target population comprised 23 secondary schools in the district out of which 11 schools that have had computers for at least three years were selected using a combination of stratified, purposive and random sampling procedures. This study involved 11 secondary school principals, 30 physics teachers and 250 Form Three students comprising 83 girls and 167 boys. Questionnaires, interview guide, lesson observation schedule and document analysis guide were employed in data collection. Data collection was preceded by a pilot study mainly to determine the validity and reliability of the instruments, which gave Cronbach's alpha coefficient of 0.85 and 0.78 for Physics Students' Questionnaire and Physics Teachers' Questionnaire respectively. The data collected during the study was analysed using Statistical Package for Social Sciences (SPSS) version 17.0. Descriptive statistics comprising frequency counts, percentages, means and correlations were utilised in the analysis of the data. It was found that management and technical support was moderate; mainly in the provision of ICT facilities and employment of computer teachers respectively. The use of ICT in lesson delivery was low due to factors such as inadequate facilities and lack of appropriate ICT skills among others. This study recommends sensitization of school managers on importance of ICT, the need to invest more in ICT- skills in teachers and lastly, invest in basic ICT- resources.

Introduction

The use of ICT in teaching can be a relevant and functional way of providing education to learners that will equip them with skills and knowledge required to function in the 21st century. It is against this background that the Government of Kenya (GoK) in various policy documents has articulated the importance and the role ICT could play in education particularly in science and mathematics education. The National ICT Policy was promulgated in January 2006 and the Kenya Government committed itself to improving the quality of teaching and learning through the use of ICT in schools, colleges, universities and other educational institutions (MIC, 2006). In order to achieve this, the government came up with several strategies.

First, the GoK undertook to facilitate public-private partnerships to mobilize resources in order to support e-learning initiatives through collaboration between the government and the private sector. Through *computer for schools project*, a number of schools in every district received twenty computers at a subsidized cost. Moreover, through the Economic Stimulus Programme (ESP), the government equipped 1050 schools with ICT facilities (GoK, 2010). Besides, a number of schools have acquired ICT facilities through funding from the constituency development fund (CDF), Board of Management (BoM) and Parents Teachers Associations (PTA). At the time of this study, there were 16 out of 23 schools with computers in Kimilili District. Secondly, the GoK mandated Kenya Institute of Curriculum Development (KICD) to digitalise the secondary school science content and avail it to schools (Ratemo, 2009).

Thirdly, the government has come up with strategies of training education managers and teachers on the use of ICT in school management and classroom instruction respectively. The GoK in collaboration with Flemish Association for Development Cooperation and Technical Assistance (VVOB) has set up a National ICT integration center located at University of Nairobi -Kenya Science campus (Wakhaya, 2010). One of the activities of this center, in partnership with Center for Mathematics Science and Technology Education in Africa (CEMASTEA) is to train teachers on ICT integration in mathematics and science education. Through this arrangement, over ten thousand (10,000) science and mathematics teachers have been trained (CEMASTEA, 2012). In teacher training colleges and universities, ICT is offered as a service subject under the education and communication technology. This is aimed at equipping the teachers with requisite skills and knowledge to use ICT as a tool for effective classroom instruction. In addition, the GoK through Kenya Education Management Institute (KEMI) has facilitated the training of the secondary school principals on the use of ICT in school management. This is aimed at ensuring that the school principals are computer literate and use ICT in managing their institutions effectively and efficiently since this has a bearing on performance.

Despite all these efforts, there are concerns over how ICT is being integrated in the teaching and learning process especially for the benefit of the learners. The art of integrating ICT into teaching and learning is a complex process whose success depends on a number of factors. These factors may generally be categorised into teacher factors and school factors. Teacher level factors include: teacher’s confidence in using ICT tools, teacher’s competence and training, teacher’s attitude towards use of technology and teacher’s experience, among others. School level factors include: management and technical support in use of ICT tools. The findings of this study could be useful in informing stake holders in education about the status of ICT facilities in schools and the support given to physics teachers in integrating ICT in their lessons

Methodology

A descriptive survey research design was employed in this study. Data collection was obtained using questionnaires, observation schedules, document analysis and interviews. In this study, the independent variables are teacher and school factors in secondary schools that influence the use of ICT in teaching and learning of physics. Teacher factors include: teaching experience, teacher competence in ICT use, teacher experience in using ICT and teachers’ attitude. School factors include: technical and management’s support, and school policy. The dependent variable is ‘the use of ICT in teaching and learning of physics.’ Location of the study was Kimilili District, which has two groups of schools: public and private. All the public secondary schools were targeted because of their direct support by the government and hence they are bound to have some basic ICT facilities. The study sample comprised schools that have had computers for at least three years. The expectation is that teachers, students and management in the schools have had adequate time to interact with the computers.

A total of 11 out of 23 public secondary schools that have had computers for some time were sampled for this study using stratified, random and purposive sampling techniques. These comprised of a national school, four county schools and six district schools, representing 47.8% of the total number of public secondary schools in the district. A study sample in the range of 10-20% of the total population is acceptable as a sample in descriptive research (Ary et al., 1972). A total of 250 out of 698 form threes comprising of 85 girls and 165 boys, representing 35.8% of physics students in the district were sampled for this study. Thirty physics teachers (71.2%) and eleven school principals (47.8%) participated in the study. Table 1 shows the study sample.

Table 1: Sample for the Study

	Total	Sample	%
Number of secondary schools in Kimilili District	23	11	47.8
Number of Physics teachers in Kimilili District	41	30	71.2
Number of Form 3 physics students in Kimilili District	698	250	35.8
Number of school Principals in Kimilili District	23	11	47.8

Source: DEO Kimilili District, (2013)

In this study, questionnaires were used to collect information from the physics teachers and students. The researcher used this tool because of its objectivity and also the data generated is quantifiable ready for statistical analysis (Saunders et al., 2007; Mugenda and Mugenda, 1999).

Interview guide was used to collect of data from the school principals who are often quite busy and may not have adequate time to respond say to a questionnaire. In addition, it is a flexible tool for data collection, enabling multi-sensory channels to be used: verbal, non-verbal, spoken and heard. While regarded as powerful, an interview schedule can also be open to bias if not administered professionally.

In order to verify information obtained through self-reporting by respondents, lesson observation guide was used to gather information on the use of ICT when teaching physics. Data gathering through observation entails observing people's behavior so as to get information about phenomena of interest (Johnson and Christensen, 2004). Lesson observation tool provided information on teacher's level of using ICT in the classroom. This is an important tool because it provides information about the actual behavior of those under observation.

The research also utilised document analysis to gather data. Among the documents analyzed were schemes of work, lesson plans, and store ledgers. This was to ascertain whether physics teachers utilise ICT tools in preparation of documents such as schemes of work, lesson plans and lesson notes, among others. In addition, the tool was used to ascertain if the teachers plan with ICT tools in mind. Stores ledgers were analysed to ascertain the availability and management of ICT tools and facilities.

Piloting was conducted to determine the reliability and validity of the research instruments. To ensure construct validity, the clarity of the items and level of language were checked in consultation with the researcher's course supervisors and ICT specialists. The reliability of the Physics Teacher Questionnaire (PTQ) and Physics Student Questionnaire (PSQ) was determined by calculating Crombach's alpha using SPSS. The alpha coefficient of reliability was found to be 0.85 and 0.78 for PSQ and PTQ questionnaires respectively. According to Mugenda and Mugenda (1999), if the value of r is 0.6 or greater, then the data obtained is reliable. The presentation and interpretation of the analysed data was done using tables and figures under the following headings: background information, management's and Technical support,

Results

Background Information

The background information regarding the physics teachers, students and principals of the sample schools is presented in this section.

Teachers

Gender. The results indicated that 13% and 87% of the physics teachers in the sample schools were females and males respectively. This skewed ratio is a reflection of the low population of girls pursuing physics to higher levels of education.

Professional qualifications. This study showed that all physics teachers in the sample schools are professionally qualified with 60% and 13.3% having Bachelors and Masters Degrees respectively. This is an important aspect since according to Allison (1997) skilled and knowledgeable workforce is closely linked with successful implementation of technology.

Teaching experience. Teachers' teaching experience was considered in a range of five years (Table 2).

Table 2: Teaching Experience of Teachers in Years

Teaching experience	Frequency	%	Cumulative %
Below 5 years	6	20.0	20.0
Between 5 and 9	9	30.0	50.0
Between 10 and 14	7	23.3	73.3
Between 15 and 24	8	26.7	100.0
Total	**30**	**100.0**	

The results showed that the majority of the teachers have a working experience of above five years. Long experience of teaching a particular subject is important because it could contribute to good content mastery and confidence in the teacher.

Experience in using computers. Teachers were asked to indicate their experience in handling computers in one form or another. The findings are summarized in table 3.

Table 3: Physics Teachers' Experience in using Computers

Experience in computer use	Frequency	%	Cumulative %
Below one year	7	23.3	23.3
1-2 years	4	13.3	36.7
3 to 4 years	9	30.0	66.7
More than 5 years	10	33.3	100.0
Total	**30**	**100.0**	

It was observed that 43.3% of the teachers in the study sample have interacted with computers for between one and four years while 33.3% have computer experience of more than five years. This is regarded as good enough to venture in IT-integration if given support.

Training on how to use computers and integrate in teaching and learning of Physics. Training is a useful component when it comes to skill development. Findings indicated that a good proportion (70%) of the teachers in the sample schools have been trained on general use of computers. The study also showed that 60.0% of the physics teachers in the sample schools have been trained on how to integrate ICT in the teaching and learning of physics. Such training is said to be effective if teachers are able to use ICT in teaching physics in the classroom.

However, different institutions with varying training contents have offered the workshops. Some of the teachers indicated that they were trained through SMASSE INSET, others through the HP program being implemented by Kenyatta University, while others attended Intel teach course sponsored by Intel Corporation and implemented by trainers drawn mainly from CEMASTEA. This kind of uncoordinated arrangement is likely to give packages which lack harmony and hence ineffective.

Students

Physics students experience in using computers. The main focus of this study was the students. This formed a total of 250 from 11 secondary schools. A total of 250 Form three students, comprising 34% female and 66% Male responded to PSQ. This ratio, which reflects the population of physics students by gender in the district, suggests that there is still a disparity among students pursuing physics to higher levels. Physics has been perceived for a long time as a male domain. The study showed that 82.0% of Form Three physics students in the sample schools have interacted with computers as compared to only 18.0% that have never. This means that most students have an opportunity to access a computer either at home or cybercafé for those who can afford, or at school. The fact that some of the students have never handled computers could mean lack of proper policies in some schools that would ensure that every student could access computers (Table 4).

Table 4: Physics Students' Experience in Using Computers

Experience in computer use	Frequency	%	Cumulative %
None	45	18.0	18.0
Below one year	43	17.2	35.2
1-2 years	74	29.6	64.8
3 to 4 years	42	16.8	81.6
More than 5 years	46	18.4	100.0
Total	**250**	**100.0**	

Students' experience in using the Internet. Internet is an important ICT tool for communication, conducting research and entertainment. The students were required to indicate how long they have used Internet for whatever purpose (Table 5).

Table 5: Physics Students' Experience in Using Internet

Experience	Frequency	%	Cumulative %
None	26	10.4	10.4
Below one year	113	45.2	55.6
1-2 years	40	16.0	71.6
3 to 4 years	39	15.6	87.2
More than 5 years	32	12.8	100.0
Total	**250**	**100.0**	

A large percentage of 89.6% of the students have used Internet. This proportion is higher compared to those who have interacted with computers (82.0%). This could mean that the students access Internet using other ICT tools such as mobile phones and I-pads among others. Exposure of students to computers is a useful step for teachers to capitalize on when it comes to integration of IT-in instruction.

Secondary School Principals

School Principals' facilitation. School principals can play a very important role when it comes to formulation and implementation of school ICT policy as well as supporting teachers and students. Information was sought from 11 school principals mainly through face-to-face interviews.

Working experience of school principals and IT support. Effectiveness and efficiency of a principal in managing a school could depend on his or her working experience because of leadership skills gained over time. The focus of this item was on the number of years one has been a principal (Table 11). A high percentage of 72.7% of the school principals in the sampled schools had working experience of more than 5 years. Long working experience is good because a principal will be able to understand, articulate and implement Government of Kenya (GoK) ICT policies better.

The principals were required to state whether they have attended any formal training in computer use. This is considered important because a principal who is computer literate could easily use knowledge and skills gained to guide other teachers on the same. Six out of eleven principals were trained (Figure 1).

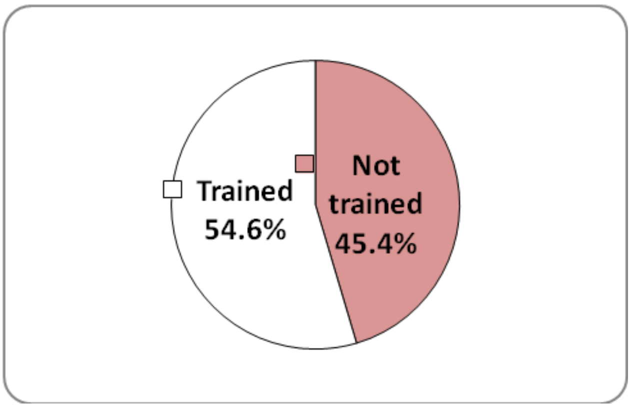


Figure 1: School Principals Trained in Computer

The findings showed that 54.6% have been trained on computer use. The others (45.4%) have learned how to use computers on their own. The encouraging aspect is that nearly all principals are computer literate, an aspect that they can use to promote IT in schools.

School management's and technical support to physics teachers and students in use of ICT in teaching and learning. Management support refers to the support given by the school principal and the entire administration to teachers and students. It is important because it is at this level where decisions on implementation of new policies such as adopting new educational innovations are made. Technical support is equally important because teachers could relax on using computers when they are not sure of where to get assistance when something goes wrong.

Information on school management's and technical support was gathered through, Physics Student Questionnaire and Principals Interview Guide. Using questionnaires Physics Teachers Questionnaire and Physics Students Questionnaire, teachers and students were required to rate the extent to which they experience certain challenges with regard to use of ICT in the teaching and learning of physics using; *very great*-4, *great*-3, *little*-2, *very little*-1, *Not at all*-0. The mean score (x) was calculated and interpreted based on the guide; $2.5 < x \leq 4$ for *low support*, $2 < x \leq 2.5$ for moderate *support* and $0 \leq x \leq 2$ for *effective support*. In addition, the respondents were required to indicate how many hours per week computers are accessible to them.

Also the school principals were interviewed on the kind of support they give to both the teachers and students in integrating ICT in teaching and learning of physics.

Challenges faced by teachers and students when using ICT for institutions. The summary of findings is given in table 6.

Table 2: Challenges Faced by Teachers

Challenge	N	Mean (Max = 4)
Lack of clear plan to access computers in the school	30	1.83
Slow Internet	30	2.40
Inadequate time to use computers in class	30	2.27
Frequent power failure	30	2.23
Inadequate number of ICT tools	30	2.53
Break down of ICT tools	30	1.90
Slow and old computers	30	1.90
Lack of technical support	30	2.37
Overall mean		**2.18**

The study showed that management and technical support as reported by teachers is moderate (**Mean =** 2.53). One of the major challenges being experienced is inadequate ICT facilities. Students were also asked to indicate the challenges they experience in the use of ICT in learning physics. Table 17 shows the findings based on Physics Students' Questionnaire.

Table 73: Challenges Faced by Students

Challenge	N	Mean (Max = 4)
Lack of clear plan to access computers in the school	250	2.14
Inadequate time to use computers in class	250	2.10
Frequent power failure	250	1.72
Inadequate number of ICT tools	250	2.00
Break down of ICT tools	250	1.50
Slow and old computers	250	1.58
Lack of technical support	250	1.89
Overall mean		**1.85**

The management and technical support in the use of ICT in teaching and learning of physics is moderate as reported by students. The major challenge being experienced is inadequate ICT facilities (mean = 2.00), which is in agreement with what teachers reported. This was also alluded to by the school principals. Indeed, a comment by the principal in school D illustrated this challenge:

> We are grateful to GoK for providing us with basic ICT facilities, but they are inadequate due to large number of students in our schools occasioned by free day secondary education. For example, in my school, I have almost 1000 students who share 20 computers. I'm appealing to all stakeholders in education to continue supporting us in this area.

Lack of clear plan by the schools for the students to access ICT facilities especially computers, inadequate time to use computers in class, slow Internet and lack of adequate time to access computers were also cited by both the teachers and students as other barriers to ICT uptake in schools.

Number of hours computers are accessible to physics teachers. This was considered important as it determines the experience being gained by the teachers, which in turn could affect the adoption rate of ICT in the schools. Table 8 shows the results.

Table 4: Hours Per Week Computers are Accessible to Teachers

Number of hours	Frequency	%	Cumulative %
None	2	6.7	6.7
less than 1	3	10.0	16.7
1 to 2	6	20.0	36.7
3 to 4	6	20.0	56.7
More than 5	13	43.3	100.0
Total	**30**	**100.0**	

The study revealed that 43.3% of teachers access computers for more than 5 hours per week. Thirty percent of them access computers for less than two hours per week. This time is insufficient for teachers to prepare ICT integrated lessons using computers. According to Sicilia (2005), teachers take much more time to design projects that include the use of new ICT than to prepare traditional lessons. Few of the teachers (6.7%) hardly access computers. These limiting ratios could mean that they are not keen or there is inadequate support by the school.

Most of the physics teachers (66.7%) teach between 20 and 24 lessons per week. This is below 27 lessons per week recommended by Teacher's Service Commission (TSC) and such a load can be considered modest. Teachers would be expected to use this advantage to learn ICT skills and plan for integration. However, this appears not to be the case. This could be due to inadequate ICT facilities, lack of interest by the teachers or lack of requisite skills to integrate ICT in teaching of physics, among other reasons. It is a common misconception that access to technology on its own motivates teachers to incorporate it in their teaching.

Support by school principals. A total of 11 school principals were interviewed and the results are shown in table 9

Table 9: Support by School Principals

Variable	No. Of school principals	%
Implementation of school policy on ICT integration	7	63.6
Employment of a computer teacher	11	100
Acquisition of ICT tools	5	45.5
Facilitation of training of teachers on ICT integration	3	27.3

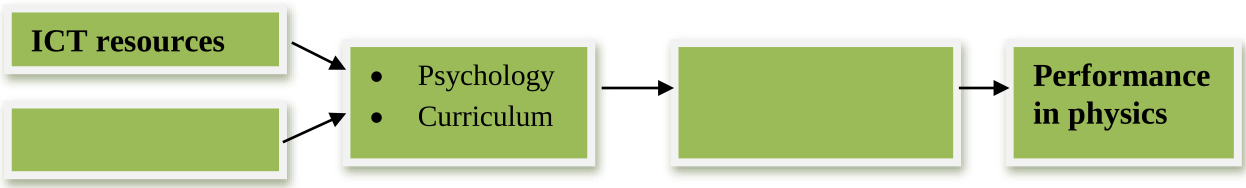
The study results indicated that 63.6% of the schools have some form of policy to support ICT use in teaching and learning. The policies were in form of dos and don'ts. For example, teachers are required to type schemes of work, lesson plans and tests before handing them in. In school B, the principal said:

> The workload for my secretary has now reduced since I introduced the policy requiring that all teachers type their own schemes of work, lesson plans and examinations. I have placed computers in each department as well as in the staff room to facilitate my teachers in this. I have also placed computers in the library with e-content in biology, chemistry and physics. On average, fifty students and at least eleven teachers access them daily.

The remaining 36.4% of the schools did not have any policy on ICT use in teaching. The principals of all the sample schools had computer teachers employed either by TSC or BoM. Computer teachers come in handy in assisting other teachers on technical issues. Only 27.3% of the school principals had taken some initiative to have their teachers trained on how to integrate ICT in teaching. From the responses, one can conclude that the principals are making quite an effort to promote ICT in teaching and learning.

The School as a System

A school is a system with inputs and outputs. The inputs include ICT resources, physics teachers among others. For ICT to have an impact on performance in physics, the school management must play their roles well i.e. put in place policy, facilitate training of teachers and provide conducive environment that promotes use of ICT in teaching and learning.



Conclusions and Recommendations

This paper presented an investigation of ICT integration in the teaching and learning of physics in secondary schools in Kimilili district. It revealed that ICT tools such as computers were mainly used for typing of lesson plans, schemes of work and analysing students' test scores. However, ICT use during lesson delivery was minimal. ICT will benefit both the learners and teachers if it is made use of during lesson planning, lesson delivery and in assessment.

The study established that management's and Technical support in sample schools is moderate, Technical and administrative support encourages teachers to successfully use ICT in classrooms. According to Yee (2000), a leader who implements technology plans and also shares a common vision with the teachers stimulate them to use technology in their lessons. This study established that physics teachers do not have adequate time to plan ICT integrated lessons since access to ICT facilities within the schools is limited to one hour or less per day probably due to limited ICT facilities.

Successful integration of ICT in teaching and learning requires support of all stakeholders specially school management. It is therefore recommended that school managers should provide more ICT resources, which were found to be inadequate in most schools. It is also recommended that school principals be sensitised on the importance of ICT in teaching and learning. Lastly, it is also recommended that school managers should invest more in ICT facilities.

References

Ary, D., Jacobs, L., & Razeriah, A. (1972). *Introduction to Research in Education*. Holt, Reinhart and Winston, New York.

Allison, L. (1997). *Factors which, potentially, will enable teaching staff to make more effective use of ICT for learning and teaching*: Centre for Academic Practice, University of Strathclyde, Glasgow G1 1QE. Retrieved on 20th January 2014 from https://www.google.com/#q=Allison+%281997%29+and+ICT .
CEMASTEA (2012). *Monitoring and Evaluation report*. Unpublished, Nairobi.

Government of Kenya (2010). *Progress on the implementation of flagship projects under the social pillar, Vision 2030*. Retrieved on 12th March 2013 from http://www.vision2030.go.ke/index.php/pillars/project/Social/143

Johnson, B., & Chritensen L. (2004). *Educational Research: Quantitative and Qualitative approaches*; Boston; Allyn & Bacon.

Ministry of information and communication (2006)- *National ICT policy:* retrieved on 6th April 2012 from http://www.information.go.ke/doc.ict20policy.pdf

Mugenda, O. M., & Mugenda, A. G. (1999). *Research methods: Quantitative and Qualitative Approaches*. Acts

Press, Nairobi.
Saunders, m., Lewis P., & Thornhill, A. (2007). *Research methods for business students. 4th edition:* Prentice Hall, England.
Sicilia, C. (2005). *The Challenges and Benefits to Teachers' Practices in Constructivist Learning Environments Supported by Technology*. Unpublished Master's Thesis, McGill University, Montreal.
Wakhaya, M. N. (2010). *Influence of the use of information and communication technology on teaching and learning of mathematics in secondary schools*; a case of Nairobi province, Kenya. Unpublished, Master's research thesis, University of Nairobi,
Yee, D. L. (2000). *Images of school principals' information and communication technology leadership.* Technology, Pedagogy and Education, 9(3), 287-302.

IMPACT OF VIDEO ASSISTED INSTRUCTION ON STUDENTS LEARNING MOTIVATION-A POSITION PAPER

Judy Njoki Makira	John Kimemia	Samson R. Ondigi
Kenyatta University	Kenyatta University	Kenyatta University
judymakira@gmail.com	jhnkimemia@yahoo.com	ondigi@yahoo.com

The use of e-resources in curriculum delivery promises better methods of content delivery. Among the various technologies currently available, video technology can be used for teaching and learning. The purpose of this study was to investigate the impact of video assisted instruction on learning motivation. The study examined whether video assisted instruction developed using David Jonassen's constructivist principles and within the framework of Keller's (1983) ARCS (Attention, Relevance, Confidence and Satisfaction) model of motivation can affect students' learning motivation. The study concludes that videos are ideal for enhancing learning. However, this depends largely on how they are designed and used. It is also evident from this study that Jonassen's theoretical arguments, more so, the characteristics of meaningful learning and the "mind tool concept" are highly effective in using videos to enhance learning motivation.

Key words: Impact, Video Assisted Instruction, Learning Motivation

Introduction

The relatively recent introduction of technology into mainstream schooling has been widely expected to penetrate and transform teaching and learning across the curriculum. With the rapid increasing popularity of the internet in the recent years, the diversity of learning programs continue to shift and change according to the demands of society. The pace of change brought by new technologies has had a significant effect on the way people live, work and play worldwide. New and emerging technologies challenge the traditional process of teaching and learning (Fakeye, 2010). Whereas technology cannot replace teachers, it forms an important and additional resource for the teachers and learners (Ratemo, 2011). In today's digital world, the success of an education system depends on collective ability to close the gap between technology's mere presence and its effective integration into the curriculum. The use of e-resources in curriculum delivery in particular promises better methods of content delivery and expanding the teaching and learning resource base. The e-resources used in teaching and learning must thus, be geared towards meeting the educational goals and objectives (Ratemo, 2011).

Instructional Benefits of Videos

Among the various technologies currently available, video technology can be used for teaching and learning. It can convey information in a more interesting way and allow the portrayal of complicated concepts. In addition, compared with expository materials, stories in videos can help learners easily understand and remember the content learnt (Jonassen & Wilson 1999). Audiovisual materials provide a rich medium of teaching and learning. Videos, viewed either through television or computer is a good tool for teaching and learning. Ayot (1987) states that words alone are liable to distortion. Media facilitates the understanding of complicated concepts and ideas. They make learning a fulfilling experience. The video as an e-resource has supported education for many years. Video has the ability to convey material through auditory and visual channels, creating a multi-sensory learning environment (Hibbert, 2014). Research has shown that teachers, who use instructional video report that their students retain more information, understand concepts more rapidly and are more enthusiastic about what they are learning (McKinnon, 2014). However, the use of video as an instructional medium has not yet been entirely embraced to enhance teaching and learning. More so, not much research has been done on the impact of technology based instruction on learning motivation based on theories and models that are most useful in addressing issues of educational technology.

Effective Ways of Using Instructional Videos in Teaching English

Research has shown that whether instruction-using video is successful or not depends on how it is designed and used. When using videos, studies show that their effectiveness increases when it becomes interactive. Statistics indicate that students retain 75-90% of what they see, hear and do. This is in contrast with the retention rate of 20% of what they hear and 30% of what they see (Eskicioglu, 2003). Interaction allows for deeper understanding and therefore better retention. A research carried out by Salomon (1984) showed that learners tend to fail in learning from televised instruction because they are not engaged in it. This shows that learning from television can be effective if learners actively process the messages from the television. The teacher should thus create situations where students actively view the media. They may ask questions, make predictions or even record their impression of the images or words. Another factor to consider is the amount of video used. Extraneous information especially at the beginning of a lesson can impede learning. This extra content can activate the wrong schema and make it difficult for students to interpret the meaning and apply it to the lesson (Collet et al 2006). To make videos more meaningful, the teacher may select video clips and focus on the specific content as it relates to the lesson.

With regard to the extent of student engagement in using video as an instructional media, three levels of video integration can be identified in the teaching and learning process (Brooke, 2003). In the first level, video materials can be used for simple viewing and listening to the content to elicit discussion and communication in the classroom. The next level of video integration in the learning process is using video for self-reflection, assessment of learning accomplishment and supporting hands-on class assignments. Video based assignments extend beyond passive video watching by requiring students to interact and respond to the video content. For instance, after watching the videos, the students are asked to complete follow-up exercises or answer questions about the presented materials. The highest level of using video technology involves students as creators of video scripts and video materials. This involves the following steps: planning the video, working on the language aspects, movie production and showing the completed video. This level is the most effective in promoting collaborative learning among students. The purpose of this position study was to investigate impact of video assisted instruction on learning motivation. To achieve this purpose, the study examined whether video assisted instruction developed using David Jonassen's constructivist principles and within the framework of Keller's (1983) ARCS (Attention, Relevance, Confidence and Satisfaction) model of motivation.

The Concept of Motivation

Motivation is a general term used to describe the conditions that cause one to begin an activity and pursue it with vigor and persistence (Twoli et al 2007). Ayot (1987) defines motivation as the degree of desire to learn new things, to put in more time to study and to find out more about what is being taught and to cooperate with the teacher in order to gain knowledge from his experience. There are two types of motivation: Intrinsic and extrinsic. Intrinsic motivation is also referred to as self-imposed motivation. The reason for doing something is in the action. The drive, wish or desire is from within an individual. This kind of motivation goes deep into our personality. Extrinsic motivation depends on other rewards that are external to the action itself. This type of motivation is supported and enhanced by external influences such as promised rewards, promotions and commendations. Extrinsic drives are external to the individual and do not support learning as much as intrinsic ones (Twoli et al, 2007)

Maslow has argued that human beings function in a hierarchy of needs, which must be satisfied for their well-being. The first four levels are called deficiency needs because when these needs are not met, motivation increases to find ways of satisfying them. When they are satisfied the motivation for fulfilling them decreases (Were, 2003). They are followed by security and safety needs (Shelter, warmth and self-defense). When one is physically comfortable and secure, he/she aspires to fulfill social needs for self esteem and ego needs. This includes the need to become independent, to receive esteem of others, to dominate and to acquire possession. When Maslow’s theory is applied to education, it means that for children to learn, they must fulfill the deficiency needs. They cannot seek intellectual achievement when the basic needs for survival, safety, belongings and self-esteem have not been met. According to Were (2003), it is important to motivate the learners because motivation: (a) inculcates interests and enjoyment in the earning process, (b) arouses the learner’s curiosity, (c) creates in the learner the desire to earn more, (d) makes the earners anxious to earn, and (e) sustains the learners’ attention.

Motivation is an essential factor that learners should have for successful learning. It is key to any teaching and learning because it leads to discipline and effective learning. Developing life-long learners, who are intrinsically motivated, display intellectual curiosity, find learning enjoyable and continue seeking knowledge after their formal instruction has ended has always been a major goal of education (Small, 1997). Were (2003) expounds on the various ways that the teacher can motivate and/or sustain the learners’ attention in learning. One way is maintaining success expectations. This can be done by seeing to it that students have large measure of success in class which raises their aspirations and makes them strive on, for example, by giving clear, challenging but reasonable assignments. Another way is by using interesting teaching strategies and methods. This means paying attention on heuristic as opposed to expository strategies. The teacher can in cooperate in the teaching games-like activities as well as use of audiovisual devices. The teacher may also provide learners with opportunities for active responses. Every learner must be actively involved in the lesson through activities, which are worthwhile and interesting.

Theoretical Perspectives

Research has shown that whether instruction using video is successful or not depends on how it is designed and used. This part focuses on theoretical perspectives for analyzing the instructional significance in using videos in teaching and learning. The study will thus provide insights into how videos can be used in a pedagogically meaningful way in the teaching and learning processes. The study, specifically, focuses on David Jonassen’s constructivism principles and John Keller’s ARCS (Attention, Relevance, Confidence and Satisfaction) model of motivation. Each of these two schools of thoughts posits basic principles and theories about learning. This informs the goals and models that the theories have for instruction, which in turn will influence the design and use of instructional media. The study, therefore analyzes the basic underpinnings of the two theoretical perspectives, previous research done and the application of each of the theories in integration of videos in teaching and learning.

David Jonassen’s (1999 & 2000) Constructivist Principles

Constructivism is a learning theory that argues that knowledge is gained through personal experience. Constructivists view learning as a formation of abstract concepts in the mind to represent reality. They posit that learning occurs when a learner constructs internal representations for his or her unique version of knowledge. Constructivism argues that interactive activities in which learners play active roles can engage and motivate learning more effectively than activities where learners are passive (Zhang et al, 2006). According to this theory teachers move away from lecturing and become facilitators, pointing students in the right direction and allowing them to gain knowledge on their own, combining current and past experiences. Constructivism as a paradigm posits that learning is an active, constructive process. The learner is an information constructor who links new information to prior knowledge. The originators of constructivism include Jonassen, Vygotsky, Piaget, Dewey and Rorty.

A reaction to approaches such as behaviorism and programmed instruction, constructivism states that learning is an active contextualized process of constructing knowledge rather than acquiring it. Knowledge is constructed based on personal experiences and hypothesis of the environment. Learners continuously test these hypotheses through social negotiations. Each person has a different interpretation and construction of knowledge process. The learner is not a blank slate but brings past experiences and cultural factors to a situation. Constructivists argue that knowledge cannot be simply transmitted from the instructor to the learners because the learners have not experienced all that the instructor has. Although the instructor and learner share an experience, learner interpretation would be very different from the instructor’s because the instructor is relating to a very different set of prior experience. Therefore, constructivists think that learning is a process of helping others construct their own meaning from the experiences they are provided with (Choi & Johnson, 2005). Jonassen and Wilson (1999) proposed a model for designing constructivist learning environments. Since the epistemological belief of the constructivism that knowledge cannot be transmitted, the design puts emphasis on providing learning experiences that facilitate knowledge construction and in meaning making. Jonassen and Wilson (1999) describes the following essential components in the constructivist learning environment (CLE): (a) problem, question or project as the focus of the environment: The focus on problem, question or project constitutes a learning goal driving the learning process. The desired quality of this driving power is to be interesting, relevant and authentic. Three major components need to be included in the design of the problem: The problem context: a description of the physical, organization, and sociocultural context in which the problem occurs should be represented to the learners. The problem representation or simulation: the principle of representing the problem is to make the representation interesting, appealing and engaging. The representation of the problem needs to be authentic to present the same types of cognitive challenges as those in the real world, as well as to be interesting and relevant to the learners so that they can engage in solving the problems. The problem manipulation space: meaningful learning needs to be a mindful activity, in which the learners are provided opportunities to manipulate objects and interact with the environment. The problem manipulation spaces exactly provide such opportunities. They can be the causal models for students to test the effects of the manipulation by receiving feedback in the changes of the physical objects or the simulation, or they can be the students' argumentation to support their solutions to problems; (b**)** related Cases: Representing a set of related experience, the related cases support learning by memory, providing different perspectives, themes and interpretations, the related cases conveys the complexity of the problem and enhance student cognitive flexibility; (c) information Resources: CLEs have to provide just-in-time information to help learners comprehend and solve the problem; (d) cognitive tools: Cognitive tools are tools that help visualize, organize, automate, or supplant thinking skills. These tools include instructional media like computers, videos, audiocassettes, print media.

A term that Jonassen is famous for using is “mindtool” (Jonassen, 2000). This term is central to his educational philosophy that blends constructivist principles with modern educational technology. According to Jonassen, Mindtools are knowledge construction tools that learners learn with, not from (Jonassen, 2000). This allows learners to build their own knowledge base. Some examples of mindtools include videos, audios, computer programs, Using mindtools allows learners to analyze, evaluate, synthesize, problem solve, and reflect on what they know in order to build their knowledge base (Jonassen, 2000). In today's classroom, where teachers are encouraged to move away from the traditional lecture style of teaching and incorporate more discovery learning, Jonassen's mindtools can become a very important part of every teacher's repertoire. Jonassen (2002) describes characteristics of meaningful learning:

Active. Within the constructivists' views on learning, students learn best if they take an active role in their own learning. According to Jonassen and Wilson (1999), active learning means that learners are engaged in the learning process in a mindful processing of information where they are responsible for the results. As active learners, they are encouraged to inquire, inform, evaluate and express new ideas. They are able to use different production and cognitive tools like videos actively in their learning environment (Jonassen, 2000).

Constructive and reflective. Constructive learning means that learners accommodate new ideas into their prior knowledge. Learners are encouraged to engage exploration, articulation and reflection; teachers should build on foundational knowledge of students. It is important to use learning experiences that facilitate knowledge. Activity is essential but insufficient for meaningful learning. We must reflect on the activity and observation and interpret them.

Collaborative and conversational. Working in learning and knowledge building communities makes it possible for learners to exploit each others' skills and provide social support and modeling for each other (Jonassen, 2002). Learning is a dialogue, that is, a process of internal or social negotiations. This exposes learners to different perspective. A meaningful use of videos is one in which the learners use conversation and collaboration. Moving images have been seen as being able to generate a rich classroom discussion (British Film Institute Primary education working group, 2003)

Contextual. Jonassen (2002) says that contextual learning is that which a resort to learning asks that are either situated in meaningful real-world tasks or simulated through a case based or problem based learning environment. Videos have the ability to create a representation of the real world environments that employ the context in which learning is relevant. Videos are also beneficial in depicting places, people, events and situations that would otherwise be very hard for the students to visit or encounter.

Intentional. Human behaviour is naturally goal-directed. When students actively try to achieve a learning goal that they have articulated, they think and learn more. For students to experience meaningful learning, they must be able to articulate their own learning goals and monitor their own progress.

David Jonassen's theoretical arguments are good frameworks in designing and utilizing programs on video assisted instruction, and therefore applicable to this study. Firstly, the concept of mindtools is significant; Jonassen describes mindtools as, cognitive tools, critical thinking devices, intellectual partners and a concept (Jonassen, 2000). Mindtools represent a constructivist approach for using videos to engage learners in representing, manipulating and reflecting on what they know, not producing what someone tells them. When using the videos as mindtools, knowledge is built by the learners, not provided by the teacher. The characteristics of meaningful learning are also applicable in relation to learning with videos.

These characteristics will provide insights into how videos materials can be used in meaningful way of teaching and learning, and more so, to enhance learning motivation. They may not be all met at the same time:

> Applying all these characteristics in assessing a teaching and learning does not mean that all of them should be present at the same time. If one or more of them fails to occur, learning can still be meaningful and constructive (Karppinen 2005 p 246).

Keller's (1983) ARCS Model of Motivation

The ARCS (Attention, Relevance, Confidence and Satisfaction) model of motivation was developed in response to a desire to find more effective ways of understanding the major influences on motivation to learn, and for systematic ways of identifying and solving problems with learning and motivation. The model is a systematic problem solving approach that requires knowledge of human motivation and progresses from learner analysis to solution design. Mere specifically, the process includes knowing and identifying the elements of human motivation, analyzing audience characteristics to determine motivational requirements, identifying characteristics of instructional materials and processes that stimulate motivation, selecting appropriate motivational tactics and applying and evaluating appropriate tactics (Gayla, 2009).

The model defines four major conditions that have to be met for people to become and remain motivated. These are attention, relevance, confidence and satisfaction. The ARCS motivation model was grounded in expectancy value theory, which assumed that people would be motivated to engage in activities if they perceive there is a positive expectancy, to be successful and if the activities are linked to the satisfaction of their needs. The ARCS model includes four conditions: Attention, relevance, confidence and satisfaction (Keller, 1983 cited in Choi & Johnson 2005). Keller (1987) breaks each of these four ARCS components down into strategy sub components:

Attention. The first and single most important aspect of ARCS is gaining and keeping the learners' attention. This can be achieved by sensory stimuli, inquiry arousal, thought provoking questions and variability. The variance can be in form of exercises and use of media. The use of videos in teaching and learning offers this variance.

Relevance. This involves establishing relevance in order to increase learners' motivation. To do this, the teacher may use simple language and illustrations that learners are familiar with and the use of media to create contexts of learning. With videos in the classroom, students often make new connections between curriculum topics and the world outside classroom. The teacher should also provide goal orientation, that is, presents the objectives and useful purpose of the instruction and specific methods for successful achievement and motive matching, which implies matching objectives to students' needs and motives.

Confidence. This involves the need to match learners' challenges to their capabilities. The learners should be informed about learning, performance requirements and assessment criteria. Success opportunities should also be provided to learners even under challenging and meaningful situations. The teacher should also enhance personal responsibility by link learning success to student personal effort and ability.

Satisfaction. The last component of Keller's ARCS model of motivation is satisfaction. The model presents a direct link between satisfaction and level of motivation. This involves the need to provide learners with intrinsic and extrinsic rewards. Learners should be proud and satisfied of what they have achieved throughout the learning. In providing intrinsic reinforcement the teacher should be encourage and support intrinsic enjoyment of the learning experience.

The ARCS model of motivation design is a heuristic approach to increasing the motivation appeal of instruction. ARCS provide a useful framework for both the design and improvement of the motivational quality of a range of informational entities. In this vein, video based instructions that provide these conditions should be able to promote learners' motivation. Research offers evidence of effectiveness of videos on learning motivation. A research carried out to investigate the effect of context -based video instruction (Choi and Johnson, 2005) revealed a significant difference in learners' motivation in terms of attention between the video based and traditional text based instruction. Moreover, learners reported that the video based instruction was more memorable than the traditional text based instruction. In another research carried out to investigate the effect of physics instructional videos as an e-learning resource on performance among secondary school students in Githunguri District, Kenya (Gakuru, 2013), findings revealed that the experimental class exhibited more frequent motivational behaviors than the control class.

Conclusion

The study concludes that videos are ideal for teaching and learning. However, this depends largely on how they are designed and used. It is also evident from this study that both David Jonassen's constructivist principles and John Keller's ARCS model of motivation are significant and may be good frameworks in designing and utilizing programs on video assisted instruction. Particularly, Jonassen's characteristics of meaningful learning are quite applicable in relation to learning with videos. The most significant characteristics, which apply to the use of videos for instruction, are activity, interactivity, collaboration and contextualization. This study also concludes that simply using videos in the classroom does not necessarily enhance learning. The ARCS motivation provides useful assistance to designers and teachers in relation to use of videos to enhance learning motivation. Designing and using them in ways that stimulate learners' interests and curiosity may lead to better learning outcomes.

References

Ayot, H.O. and Patel, M.M.(1987). *Instructional methods*. Nairobi: Kenyatta University.

British Film Institute Primary Education Working Group.(2003). *Look again! A teaching guide to using film and televisionwith three-to-eleven-year olds.*London: British Film Institute.

Brooke, S. (2003). "Video production in the foreign language classroom: Some practical ideas." *The internet TESL Journal, 9 (10).* Retrieved from http://iteslj.org/ techniques/ Brooke-video:html.

Choi, H.J. & Johnson, S.D. (2005). 'The effect of context based video instruction on learning and motivation in online courses.' *The American Journal of Distance Education. 19 (4) 215-227.*

Collet, J. and O'neil, K. (2006). '*Sometimes less is more effective: Applying educational research to the use of popular video in the sociology classroom'*. Paper presented at annual meeting of the American sociological association, Montereal Convention centre, Quebec, Canada

Eskicioglu,A.and Koppec, D. (2003). 'The ideal multimedia enabled classroom: Perspectives from psychology, education and information.' *Journal of educational multimedia and hypermedia, 12. 199-221.*

Gakuru, P. M. (2013). Effects *of physics instruction videos as an e- learning resource among students in Githunguri District.* A thesis submitted in partial fulfillment of the degree of master of education, Kenyatta University.

Gayla, S. (2009). *ARCS Model of motivational design.* Retrieved from http//: www. Teachinglearningresources/ ARCS Model

Fakeye, D.O. (2010). 'The assessment of English language teachers' knowledge and use of ICT in Ibadan Southwest local government of Oyo state.' *journal of scientific research 5 (4) 270-276 in http://www.idosi.org.*

Hibbert, M. (2014). *What makes an online instructional Video Complelling.* Retrieved on April 7, 2014 from www.educause.edu/ero

Jonassen, D. H., Peck, K. L., and Wilson, B.G.(1999). *Learning with Technology: A constructivist perspective*. Upper Saddle River. NJ: Prentice- Hall.

Jonassen, D.H. (2000). *Computers as mind tools for schools: engaging critical thinking.* Upper Saddle River, NJ:Prentice Hall.

Jonassen, D. H. (2002). *Learning as activity: Educational Technology*. Upper Saddle River. NJ: Prentice- Hall.

Karpinen,P.(2005). "Meaningful learning with digital videos: Theoretical Perspectives." *AACE Journal, 13 (3) 233-250*

Keller, J. M. (1983). "Use of ARCS model of motivation in teacher training." In Shaw, K.and Trott A.J. (eds). *Aspects of educational technology volume xvii: staff development and career updating.* London: Kogan Page.

Keller, J. M. (1987). "Development and use of ARCs model of motivational design." *Journal of instructional development and career , London: Kegan Page*

Keller, J. M. (1983). "Use of ARCS model of motivation in teacher training." In Shaw, K.and Trott A.J. (eds). *Aspects of educational technology volume xvii: staff development and career updating.* London: Kogan Page.

McKinnon, M.(2014)Teaching technologies: teaching English using video.Retrieved from

Ratemo, J. (2011). *KIE Shifts focus to digital teaching aids* .kenyatech.wordpress.com. Retrieved, April 6 2011, from http://www.kenyatech.com

Salamon, G. (1984). “Television is ‘easy’ and print is ‘tough’: The differential investment of mental effort in learning as a function of perceptions and attributions.” *Journal of educational psychology. 76 (4) 647-658*

Small, R. V. (1997). Motivation in Instructional Design. ERIC DIGEST in http://ericir.syr.edu/ithome/digests 97.htlm.

Twoli,N. ,Maundu,J. ,Muindi,O. , Kiio,M. and Kithinji,C. (2007). *Instructional Methods in education. Kenya Institute of education:* Nairobi.

Were, M.N. (2003). Instructional methods: *Teaching across the curriculum.* Nairobi: Strongwall Africa

Zhang, D., Zhou,L., Briggs, R. and Nunamaker, J. (2006). “Instructional video in e- learning: Assessing the impact of Interactive video on learning effectiveness.” *Journal of information and management 43(2006) 15-27.*

EFFECTIVE EDUCATIONAL TECHNOLOGY INTEGRATION THROUGH CAPACITY BUILDING: INEXORABLE MODERNIZATION OF THE KENYAN EDUCATION SYSTEM

Joseph N. Manyara
Kenyatta University
joseph.manyara@yahoo.com

Hellen A. Amunga
Kenyatta University
hellenamunga88@gmail.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Education is vital for laying a solid foundation for national development of every nation in the world. Information communication and technologies (ICTs) are rapidly spreading to every corner of the world. In the 21st century, the field of education is progressively taking advantage of ICTs to enhance teaching and learning by efficiently and effectively distributing knowledge. Kenya, like many other developing nations, is in need of teachers who are equipped with educational technology knowledge for effective technology integration into teaching and learning so as to modernize her education sector. This paper is a review of literature on teacher capacity building as a way of effectively integrating in teaching and learning process. This will be linked to teacher capacity building, in Kenyan context, in order to identify responsive areas of strategic interventions that will modernize the education system.

Keywords: Capacity Building, Integration, Educational Technology

Introduction

Technology is part of our daily lives today. Each technology discovery is a step towards development of mankind. In the current times technological advancements have spread far and wide on earth and many people are using the new technologies. It is now imperative to equip the entire society with the knowledge of the new inventions in technology. Information and communication technologies (ICT) are permeating the education sector and they are being used to enhance the teaching and learning process using modern delivery techniques. Therefore, ICTs should be universally acknowledged as an important catalyst for social transformation and national progress in the Kenyan education system (Kirimi, 2014). The Kenya Vision 2030 (GOK, 2007) asserts that ICT could be used to propel the country to a middle level economy by improving security, lowering cost of doing business and providing Kenyans with a friendly working environment among others. Specific strategies were to include improving the quality of education by providing quality teachers, space and technology for knowledge delivery (Mingaine, 2013). However, despite the strategies developed by the government on implementation of ICT in schools, research have established that many of them are not effectively using ICT to support learning, teaching, research and management as intended by Kenya National ICT policy (Mingaine, 2013). Meoli (2007) revealed that despite efforts made by various stakeholders and the importance of ICT in education sector, the National ICT policy has to a large extent remained in draft form. Little attempt has been made to implement the policies to schools. This called for the need to analyze teacher capacity building as one of the ways to effectively integrate technology in order to modernize Kenya's education system. It is the teachers who represent centripetal force in most educational systems worldwide and their performance is inextricably linked to educational outcomes for both learners and the system alike (Egbo, 2011). To capacity build the teachers on technology integration in their teaching and learning is a sure way to improve the educational outcomes and ensure that Kenyan education system is modernized.

Capacity Building as a Concept

Capacity building is a concept that has different meanings to different people. According to Lusthaus, Adrien and Perstinger (1999), capacity building is to enhance or strengthen a person's or organization's capacity to achieve their goals. Coutts (2003) states that capacity building entails upgrading the abilities and resources of individuals, organizations and communities to achieve a certain goal. In a similar manner, Linnell (2003) describes capacity building as activities that improve an organization's ability to achieve its mission or a person's ability to define and realize his/her goals or to do his/her job more effectively. Philbin (1996) talks about the concept of capacity building as a process of developing and strengthening the skills, instincts, abilities, processes and resources that individuals, organizations and communities need to survive, adapt and thrive in the fast changing world. United Nations Environment Program (UNEP) (2006) defines capacity building as "the process by which individuals, groups, organizations, institutions and societies increase their abilities to perform core functions, solve problems, define and achieve objectives; and understand and deal with their development needs in a broad context and in a sustainable manner". Therefore, capacity building has to do with building abilities, relationships and values that will enable organizations, groups and individuals to improve their performance and achieve their developmental objectives.

The United Nations Committee of Experts on Public Administration (2006) explained that capacity building takes place on an individual level, institutional level and societal level. On an individual level, it requires the development of conditions that allow individual participants to build and enhance existing knowledge and skills. It also calls for the establishment of conditions that will allow individuals to engage in the process of learning and adapting to change. On an institutional level, it involves aiding pre-existing institutions and supporting them in forming sound policies, organizational structures and effective modes of management. At the societal level, capacity building supports the establishment of a more interactive public administration that learns equally from its actions and from feedback it receives from the population at large. Capacity building at individual level will be of more focus since teachers in Kenya's primary and secondary levels are the focal point for effective educational technology integration as a way of modernizing the education system.

According to UNEP (2006), capacity building on an individual level has three different dimensions namely: building awareness, building analytical capacity and building decision-making capacity. Building awareness involves offering activities, presenting new topics or demonstrating new methods through workshops, seminars and conferences. The presentations are meant to create awareness about a particular activity, topic or method so as to enable beneficiaries apply them in performing assigned tasks. Building analytical capacity involves designing a capacity building program using interactive style of presentation. It uses exercises, case studies, field visits and other elements of experiential learning, which promote critical thinking among the beneficiaries. Building decision-making capacity also has to do with laying emphasis on learning-by-doing as well as formal education. The beneficiaries are exposed to professionals to receive training on project completion. By so doing, the beneficiaries acquire learning-by-doing experiences. Therefore, for effective educational technology integration demands for teacher capacity building during the pre-service training as well as in-service training for they are the one to implement it in the classroom.

Thus, capacity building is an integral part of strengthening educational institutions and providing enabling conditions for premium performance by the individual teachers within the education sector (Solomon & Ofori, 2014). Supporting this, Mati (2008) asserts that capacity building is as important as capital investment and infrastructure. UNESCO (2006) emphasize that capacity building in education is "important both for the functioning of the education system as well as for capacity building in other sectors…an essential aspect of capacity building is enhancing the ability of individuals, institutions and systems to cope with change and unforeseen challenges". According to Pelgrum (2001), the success of educational innovations depends largely on the skills and knowledge of teachers. Teachers' lack of knowledge and skills is one of the main hindrances to the use of ICT in education both for the developed and underdeveloped countries (Mamun &Tapan, 2009; Pelgrum, 2001; Ihmeideh, 2009; Williams, 1995). It is therefore necessary to appreciate that teacher-building capacity in our institutions is, ultimately, bringing about development, growth and excellence in Kenya's education system.

Modes of Capacity Building for Teachers

A wide range of approaches is available to capacity building including training, formal education, capacity building projects, networking and others (UNEP, 2006). Reimers (2003) explains that in-service training usually consists of workshops or short-term courses that would offer teachers new information on a particular aspect of their work. Stephen et al. (2006) mentioned that conferences, workshops, seminars, consultations, study tours, participatory research, on-the job training, demonstration plots, coaching, and mentoring are the main methods to build the capacity of academic staff to guarantee a good mix of theory and practice.

On the other hand, Klasen and Clutterbuck (2002) mentioned that mentoring has been regarded as one of the learning methods used to enhance individuals learning and development in all spheres of life. Capacity building teachers through mentoring to possess the necessary sets of academic competencies can therefore have an immense impression on the effectiveness on educational technology integration into the Kenyan education system. It involves passing on skills, attitudes and knowledge from experienced teachers to the inexperienced teachers. Mentoring supports professional growth and renewal, which in turn empowers teachers as individuals and colleagues (Boice, 1992). Thus, as the protégés become empowered through the assistance of mentors, mentors themselves also feel renewed through the sharing of power and the advocacy of collegiality (Luna & Cullen, 1995). Mentors should have unparalleled skills in communicating, listening, analyzing, providing feedback and negotiating with less inexperienced persons. Eade (2007) asserts that as a mentor "you can't build capacities in others that you don't have yourself. And if you can't learn, you can't teach either."

Effective Technology Integration and Teacher Capacity Building

Technology integration capacity building is key to teachers' learning to integrate technology effectively into the classroom (CEO Forum, 1999). Teachers, as instructional designers and implementers, are very crucial for effective technology integration into the education system. Effective technology integration requires the time and attention of teachers in the role of instructional designers (Dexter, 2002). Dexter (2002) further asserts that it is the teacher who designs into the instruction any value that technology adds to the teaching and learning processes since educational technology itself does not possess inherent instructional value. Technology can neither substitute the teacher in the learning process nor have educational value without the input of the teacher. The teachers consider what they are to teach, what added value the technology might bring to the learning environment, and how technology can help to assess student's learning process (Dexter, 2002).

It is therefore imperative that teachers must have frequent opportunities to simply learn how to operate the educational technology as well as learning opportunities that address more than these basic skills like emphasizing the entire instructional domain which involve pedagogy and models of implementation strategies (Dexter, 2002). Therefore during technology capacity building classroom teachers must have an opportunity to examine their instructional objectives and develop an understanding of educational technology as an instructional tool. According to Dexter (2002):

> Professional development targeted at successful technology integration at a school increases the effectiveness of technology by ensuring that teachers' learning needs are met with both "how to operate" and "how to integrate" sessions. Because technology integration should be in support of specific outcomes and add value to and assist in the assessment of those outcomes, the professional development sessions would ideally be specific for grade levels and customized to match the outcomes they teach. This means that overall, curriculum connections should often be the central focus of technology professional development sessions and facilitate sharing or instructional planning time.

Effective technology integration is when it is used in a smooth way to support and extend curriculum objectives and engage students in meaningful learning (Dias, 1999). The instructional approach to integrate technology must involve prudent selection of technology according to the requirements of the content, framing learning objectives (Rogers, 2002).

Moersch's (1995) six-level framework for technology integration also provides a hierarchy of steps leading to technology integration. The steps are as follows: (a) **Non-use**: There is perceived lack of access to technology-based tools or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based; (b) **Awareness**: Computer-based applications have little or no relevance to the individual teacher's instructional program; (c) **Exploration**: Electronic technology is employed either as extension activities or as enrichment exercises to the instructional program; (d) **Infusion**: technology-based tools augment isolated instructional events; (e) **Integration**: technology is perceived as a tool to identify and solve authentic problems relating to an overall theme/concept; (f) **Expansion**: classroom teachers actively elicit technology applications and networking from business enterprises, governmental agencies, etc. to expand student experiences directed at problem solving, issues resolution, and student activism surrounding a major theme/concept; (g) **Refinement**: Technology is perceived as a process, product (e.g. invention, patent, new software design) and tool to help students solve authentic problems related to an identified real-world problem or issue.

Integration of technology is successful if technology does not stand out but is perfectly assimilated and easily used by both teachers and learners. This is against the occasional use of technology for obtaining information, analyzing and synthesizing the information and presenting it professionally (Harris, 2005). Effective educational technology integration in teaching and learning should aspire to enrich students' learning, support teaching and reduce routine work for teachers. It should involve phases like designing suitable learning activities that apply ICTs to support varied requirements of the learners, planning strategies to handle technology and student learning, applying it for record keeping, developing effective classroom management strategies (A framework for training in-service secondary school teachers on ICT, 2010). Integrating technology is thus not about merely technology but it is primarily about content and effective instructional practices. Integration can therefore be defined not by the amount or type of technology used, but by how and why it is used (Earle, 2002).

Technology Integration and Modernization of the Kenyan Education System

The Kenya Government has embraced technology as a key to development. Like many developing countries, the education sector in Kenya is still in its infancy in the inclusion and utilization of educational technology. In order to effectively integrate educational technology properly to improve the quality of education, technology and teaching methods in education should go hand in hand.

The Kenyan Government has put in place the National ICT Policy that provides guidelines for transformation of the Kenyan into a digital society (MOE, 2006). The report further claims that the Government recognizes that a technology literate workforce is the foundation on which the nation will become a knowledge-based economy. Therefore, the government intended to make education a platform for equipping the nation with ICT skills in order to create dynamic and sustainable economic growth. On human resource development, the policy emphasizes integrating ICTs in teaching curriculum at all levels of education; establishing e-educational networks for sharing educational resources and promoting e-learning at all levels; encouraging and supporting ICT training for decision-makers, community and civil society leaders; creating opportunities and providing assistance for the disadvantaged, women and the youth to acquire ICT competencies and skills; and enhancing capacity for research and development in ICT sector.

Embedded in the National ICT policy is the education policy which calls for recognition of the fact that ICT provides capabilities and skills needed for a knowledge-based economy. The policy also appeals for transforming teaching and learning to incorporate new pedagogies that are appropriate for the 21st century MOEST's mission which is to facilitate effective integration of technology to improve access, learning and administration in delivery education programs and services. The principal objective was to integrate ICT in the delivery of education and training curricula (MOE, 2006; Sessional Paper No. 1, 2005).

Integration of educational technology was to aim at supporting teaching and learning in the delivery of the various curricula to achieve improved education outcomes. The strategic objectives were: to establish model institutions that will be used to demonstrate integration of ICT to teaching and learning; to train at least 20 master integrators to support integration at the national and district levels and; to train teachers on integration techniques and sensitize education managers on ICT integration (MOE, 2006).

All the above was to be attained through training (capacity building and professional development). Training programs were to be intended for the education management sector comprising the entire MOEST, its agencies and institutional managers and the teaching staff force who comprise the primary school teachers and the secondary school teachers. This was to ensure that all levels of the education sector will be ICT-literate where the personnel have the capacity to improve the delivery of services and accountability and to make the information flow and data processing more efficient. For teachers will have the ability to improve teaching and learning in schools. However, the rapid changes in ICT demands continuous training at all levels.

Despite the ICT policy, not many schools in Kenya have effectively integrated ICTs to raise teacher efficiency. This can be attributed to a number of challenges facing many schools in Kenya with regard to embracing and implementation of ICTs in education. Most schools in Kenya have only adopted computers as technical subject and not integrated its use in the teaching and learning. As such, a more holistic approach requires that schools be receptive and open to the changes ICTs may make.

Conclusion and Recommendations

Effective educational technology integration is not only to operate technology and using it occasionally but requires time, training and practice. In Kenya, capacity building ought to begin in teacher training institutions where the teacher trainees can be introduced into activities like planning and developing strategies for using educational technology so as to improve the standards of teaching and learning. ICT has to be to fitted into the teacher education curriculum and facilitate instructions by teacher educators. Teacher educators need to ensure that the trainees regularly use technology and pass through the stages involving greater use of technology by the learners and finally proceed towards a phase when students use technology for problem solving and collaborative learning, while teachers become facilitators. Knowledge of teaching by integrating ICT is implicit and therefore, trainees need to experience it and try it out during practice teaching and reflect upon it as a repetitive process as teacher educators guide them through the various stages of integration.

The pre-service teacher training should be built on and enhanced by in-service capacity building. This is because ICTs are rapidly developing technologies, teachers need to continuously upgrade their skills and keep abreast of the latest developments and best practices. Teachers need not be anxious of being replaced by technology or losing their authority in the classroom as the learning process becomes more learner-centered. Thus effective educational technology integration will be enhanced once teachers have had a deep understanding and a positive reception of their changing role.

Management plays a crucial function in the effective educational technology integration in education. School leaders should recognize that implementation of ICT in schools, is a necessary revolution of how teaching and learning is done, and a chance to entice students to the modern and better learning environment. In support of ICT integration programs to be effective and sustainable, educational leaders themselves must be skilled in the use of technology, and they must have a broad understanding of the technical, curricular, administrative, financial, and social dimensions of ICT use in education. For that reason, leaders should play a leading role in promoting teachers' capacity building towards effective educational technology integration in education.

References

A framework for training in-service secondary school teachers on ICT (2010). Ministry of Human Resource Development of India. Retrieved from http://www.it.iitb.ac.in/~sri/papers/ICT_TT_Framework-3Feb2010.pdf on 15th June,2010.

Berner, J. E. (2003). *A Study of Factors That May Influence Faculty in Selected Schools of Education in the Commonwealth of Virginia to Adopt Computers in the Classroom*. (Abstract Doctoral Dissertation, George Mason University, 2003). ProQuest Digital Dissertations (UMI No. AAT 3090718).

CEO Forum on Education & Technology. (1999). School technology and readiness report: Professional development: A link to better learning, February 22. Available on the World Wide Web at: http://ceoforum.org/ reports.cfm?RID=2.

Chase, F. S. (2005). *Factors for Satisfaction in Teaching*. Phi Delta Kappa, 33, 129-139.

Dexter, S (2002). *eTIPs--Educational Technology Integration and Implementation Principles*. Idea Group Publishing. Minnesota, USA

Eade, D. (2007). *Capacity Building an Approach to People-Centered Development*. UK & Ireland: Oxfam. pp. 35.

Earle, R.S. (2002).*The integration of instructional technology into public education: Promises and challenges*. ET Magazine, 42(1), 5 -13. Retrieved from http://bookstoread.com/etp/earle.pdf on 18th June,2010.

Egbo, B. (2011). *Teacher capacity building and effective teaching and learning: a seamless connection*. Proceedings of the 2011 International Conference on teaching, learning and change (c) International Association for Teaching and Learning (IATEL), held at The Federal College of Education (Technical) Omoku, Rivers State Nigeria, September 5-8, 2011.

GOK (2007). *Kenya Vision 2030*. Government printer, Nairobi Kenya.

Harris, J. (2005).*Our Agenda for Technology Integration: It's time to choose*. Contemporary Issues in Technology and Teacher Education. 5(2), 116 -122. ICT integration Guidebook ICTPD.NET Retrieved from http://ictpd.net/techplan/ on 21st June,2010.

Ihmeideh, F. M. (2009). *Barriers to the Use of Technology in Jordanian Pre-School Settings.* Technology, Pedagogy and Education, 18(3), 325-341.

Institute For Governance and Sustainable Development Studies (2010). Capacity Building Programmes. Retrieved from http://www.igs.or.ke.

Keengwe, J., G. Onchwari, et al. (2008). *Computer Technology Integration and Student Learning: Barriers and Promise*. Journal of Science Education and Technology 17(6), 560-565.

Kirimi, J. K. (2014, January). Impact of Information Communication Technology on Education – Kenya. Journal of Educational and Social Research. MCSER Publishing, Rome – Italy. Vol. 4. No.1.

Korantwi-Barimah, J.S., Sekyere, A.M, &Ofori, A. (2014) *Mentoring: a tool for professional development of academic staff in Ghanaian Polytechnics*. International journal of innovative research & development, Vol.

3, iss.1.
Linnell, D. (2003) *Evaluation of Capacity Building: lessons from the field*. Washington, D.C: Alliance for Nonprofit Management.
Luna, G. & Cullen, D. L. (1995). *Empowering the Faculty: Mentoring Redirected and Renewed*. ERIC Digest, 24 (3).
Mamun. A. &Tapan, S.M. (2009). *Using ICT in Teaching-Learning at the Polytechnic Institutes of Bangladesh: Constraints and Limitations*. Teacher's World-Journal of Education and Research, 33-34, 207-217.
Martinez, P. (2007). *Building capacity for astronomy research and education in Africa*. In:A.Heck (Ed) Organizations and Strategies in Astronomy Volume 6. Netherlands: Springer.
Mati, B. M. (2008). *Capacity Development for Smallholder Irrigation in Kenya*. Nairobi, Kenya: International Crops Research Institute for Semi-Arid Tropics (ICRISAT). Retrieved 10 January, 2014 from http://www.interscience.wiley.com
Meoli, S. (2007). Kenya Education Network. Nairobi.
Mingaine, L (2013, January). *Leadership Challenges in the Implementation of ICT in Public Sec. Schools, Kenya.* Journal of Education and Learning. Vol.2, No.1.
Minstry of Education, (2006). *National Information and Communication Technology (ICT) Strategy for Education and Training*. Nairobi, Government Printing Press.
Moersch, C. (1995). *Levels of Technology implementation (LoTi): A Framework for measuring Classroom Technology use*. Learning and Leading with Technology. Retrieved from http://loticonnection.com/pdf/LoTiFrameworkNov95.pdf on 15th June,2010.
Morgan T. (1996). *Using technology to enhance learning: changing the chunks*. Learning and leading with technology, 23(5): 49–51.
Niyozov, S. (2008). *Understanding Pedagogy: Cross-cultural and Comparative insights from Central Asia*. In: Mundy, K.; Bickmore, K.; Hayhoe, R., Madden, M. and Madjidi, K. (eds). Comparative and International Education: Issues for Teachers. Toronto: Canadian Scholars' Press.
Pelgrum, W.J. (2001). *Obstacles to the Integration of ICT in Education: Results from a Worldwide Educational Assessment.* Computers & Education 37, 163- 178.
Philbin, A. (1996). *Capacity Building in Social Justice Organization*. New York: Ford Foundations.
Republic of Kenya, (2005). Sessional Paper No.1 of 2005. Nairobi, Government Printing Press.
Republic of Kenya, (2007). Ministry of Education Science and Technology Report. Nairobi, Government Printing Press.
Republic of Kenya, (2012). *Educaton Sector Report: Medium Term Expenditure Framework*. Nairobi, Government Printing Press.
Solomon, K.B.J &Ofori, A (2014, March). *Capacity Building: Implications for Sustainable Development in Ghanaian Polytechnics.* International Journal Of Innovative Research & Development. www.ijird.com March, 2014 Vol 3 Issue 3
United Nations Committee of Experts on Public Administration (2006). *United Nations' Economic and Social Council: Delimitation of Basic Concepts and Terminologies in Government and Public Administration*. Retrieved from http://unpanl.un-org/intradoc/groups/public/documents.
United Nations Environment Programme (2006). *Ways to Increase the Effectiveness of Capacity Building for Sustainable Development.* Discussion Paper Presented at The Concurrent Session 18.1:The Marrakesh Action Plan and Follow Up. 1A1A Annual Conference, Stavanger, Norway
United Nations Environment Programme (2006). *Ways to Increase the Effectiveness of Capacity Building for Sustainable Development*. Discussion Paper Presented at The Concurrent Session 18.1:The Marrakesh Action Plan and Follow Up. 1A1A Annual Conference, Stavanger, Norway
Williams, B. (1995). Factors contributing to successful implementation of computer technology in schools. Dissertation Abstracts International, 56(08), 3092.

IMPROVING MATHEMATICAL ACHIEVEMENT BY ENGAGING PROSPECTIVE PRIMARY TEACHERS IN LEARNING MATHEMATICS THROUGH PROBLEM SOLVING

Joanna O. Masingila
Syracuse University
jomasing@syr.edu

Victoria M. Wambua
Syracuse University
vmwambua@syr.edu

In order to improve mathematical achievement among learners, it is vitally important for teachers to develop deep understandings of the mathematics they will teach. Research studies in the last two decades, as well as committee reports, support the idea that teachers should be empowered to teach from deep and connected mathematical knowledge (Ball & Bass, 2000). However, prospective primary school teachers, for the most part, have been taught by traditional methods that emphasize rote learning and memory rather than an exploratory and problem-solving approach for acquiring mathematical knowledge by developing mathematical concepts and promoting meaningful understanding. In this paper, we argue that engaging prospective primary teachers in learning mathematics through problem solving will support them in developing deep understandings of mathematics.

Keywords: Prospective Primary Teachers, Problem Solving, Developing Mathematical Understandings

Researchers have argued that it is vital that prospective elementary teachers develop deep and connected understandings of important mathematical ideas (Ball & Bass, 2000; Ma, 1999). The Conference Board of the Mathematics Sciences (CBMS) (2012) has called for engaging prospective elementary teachers in doing mathematics and supporting them in developing deep understandings of foundational mathematical ideas that are taught in the primary grades. Researchers have argued that teachers' mathematical knowledge significantly influences how and what teachers teach and how and what their students learn (Ball & Bass, 2000; Hill & Ball, 2004; Hill, Rowan, & Ball, 2005). Ball and Bass (2000) propose that teachers' mathematical knowledge needs to be strong in order to allow them to deal flexibly with the complexity of teaching mathematics to diverse student populations. They further claim that "not providing teachers with this [mathematical knowledge] undermines and makes hollow efforts to prepare high-quality teachers who can teach all students, teach in multi-cultural settings, and work in environments that make teaching and learning difficult" (p. 94). This need to adequately prepare new teachers has been highlighted in the reform movement in mathematics education and has necessitated not only calls for different approaches to teaching mathematics, but also the reinvention of teacher education (Simon, 2000).

We propose that one way to foster deep mathematical knowledge development in prospective elementary school teachers (PTs) is to engage them in learning mathematics via problem solving (Masingila, Lester & Raymond, 2011; Schroeder & Lester, 1989). Learning through problem solving is challenging and generally requires new roles for both PTs and mathematics teacher educators (MTEs).

Teaching via Problem Solving

Teaching mathematics via problem solving hinges on the use of a constructivist theory of learning. Researchers argue that students acquire new knowledge by actively participating in the learning process (Grouws, 2003) and not through passive absorption of what their teacher models (Masingila, Lester & Raymond, 2011). Problem solving as a concept and a practice has been around as long as humans have tried to overcome challenges. Stanic and Kilpatrick (1989) note that while mathematical "problems in the curriculum go back at least as far as the ancient Egyptians, Chinese, and Greeks" (p. 1), it was "primarily within the last century" (p. 4) that educators began thinking that instead of simply presenting students with problems or rules for solving problems, students should be taught "more general approaches to problem solving" (p. 4). So the idea of teachers supporting students in problem solving is fairly recent.

Before we look at some approaches to problem solving that have been used in teaching mathematics, we want to be clear on what we mean by problem solving. We are using Lesh and Zawojewski's (2007) definition of problem solving:

> A task, or goal-directed activity, becomes a problem (or problematic) when the "problem solver" (which may be a collaborating group of specialists) needs to develop a more productive way of thinking about the given situation. (p. 782)

Note that a mathematical exercise is not a problem in that an exercise is not problematic. Students complete exercises by following the procedures they have learned. Lesh and Zawojewski argue that problem solving should not be separated "from concept development and the ways that these concepts are used in … situations beyond school" (p. 782). This connection has not always been present in some of the approaches used with problem solving in schools, but we believe that it must be an integral part of prospective teachers' learning.

There have been a variety of approaches for including problem solving in the school curriculum. Stanic and Kilpatrick (1989) list three approaches: problem solving as context, as skill, and as art. They view problem solving as context as an approach in which the problem solving is a means to achieve another end, problem solving as skill as an approach in which problem solving is one of a variety of skills to be taught to students, and problem solving as art as an approach in which students should be engaged in the art of discovery.

Schroeder and Lester (1989) also discuss three approaches, specifically aimed at the teaching of problem solving: teaching *about* problem solving in which students are taught problem solving heuristics stemming from Polya's (1957) model of problem solving, teaching *for* problem solving in which the focus is on "ways in which the mathematics being taught can be applied in the solution of both routine and nonroutine problems" (p. 32), and teaching *via* problem solving in which "problems are valued not only as a purpose for learning mathematics but also as a primary means of doing so" (p. 33). Generally, teaching *about* problem solving is somewhat similar to Stanic and Kilpatrick's (1989) approach of problem solving as skill, teaching *for* problem solving overlaps with problem solving as context, and teaching *via* problem solving shares some characteristics with problem solving as art.

We teach mathematics content courses for PTs *via* problem solving because teaching via problem solving is a powerful way for students to learn mathematics and develop deep and connected understandings of mathematical ideas. While we engage PTs in discussing their problem-solving strategies, we spend very little time teaching *about* or *for* problem solving. We do not teach about problem solving because we do not view problem solving as a topic to be taught; instead, problem solving is the vehicle through which PTs learn mathematics. We do not teach for problem solving since we do not view problem solving as something PTs engage in only after being introduced to a new concept or skill; rather, the concepts and skills arise out of the problem solving work that PTs engage in.

When students learn *via* problem solving they are engaged in making sense of mathematics by working through problematic tasks, tasks that engage them in drawing on prior knowledge, using strategic reasoning, making connections among mathematical ideas, and constructing new understandings. While engaged in solving problems, students learn mathematics differently than they do from a teacher presenting mathematical information to them. Marcus and Fey (2003) argue, "even the clearest teacher explanations leave many students with incomplete understanding and shaky confidence. Ideas that are forged by hard thought and tested in discourse with other students and teachers are much more likely to last and be useful" (p. 61). Of course, teacher telling is easier than engaging students in problem solving. However, the learning that occurs via problem solving will be deeper and more meaningful than learning that occurs through following teacher explanations.

The CBMS (2001) argues in *The Mathematical Education of Teachers* (commonly referred to currently as MET I) that prospective elementary teachers can develop deep understandings of mathematical ideas "with classroom experiences in which *their* ideas for solving problems are elicited and taken seriously, their sound reasoning affirmed, and their missteps challenged in ways that help them make sense of their errors" (p. 17). The CBMS (2012) continues arguing for engaging prospective elementary teachers in problem solving in *The Mathematical Education of Teachers II* (MET II) with its recommendation that courses for mathematics teachers should "develop the habits of mind of a mathematical thinker and problem-solver, such as reasoning and explaining, modeling, seeing structure, and generalizing" (p. 19). Thus, the mathematics community promotes engaging prospective teachers in problem solving to support the development of deep mathematical understanding. However, teaching via problem solving is not easy; in fact, it is quite challenging.

Teaching via problem solving is difficult for a number of reasons. The teacher needs to select and facilitate tasks that are appropriate for the mathematical problem solving that he or she wants the students to engage in. This involves choosing high level tasks and maintaining the cognitive demand of the tasks (Henningsen & Stein, 1997). High-level tasks engage students in making connections among mathematical ideas and doing mathematics – making and testing conjectures, justifying solutions, solving problems for which a procedure is not known – while low-level tasks involve memorization and procedures that are not connected to conceptual ideas (Henningsen & Stein, 1997). Facilitating students' engagement with high-level tasks and maintaining the cognitive demand of tasks requires pedagogical skills from the teacher. Some of these skills include scaffolding students' thinking, along with creating an environment where student explanations are expected. Darling-Hammond and Snyder (2000) argue that "[t]he process of teaching for understanding and application rather than for rote recall creates greater unpredictability in teaching as teachers must be able to understand and capitalize upon student thinking in order to manage a process of knowledge construction that is different for each one" (p. 523). A critical part of "allowing mathematics to be problematic for students is for the teacher to refrain from stepping in and doing too much of the mathematical work" (Hiebert & Wearne, 2003, p. 7). Equally important is for the teacher to know when to introduce information and what information to introduce (Lobato, Clarke & Ellis, 2005).

In a problem-solving approach, the role of the teacher changes from that of a disseminator of knowledge to that of a facilitator. Masingila and her colleagues (2011) argue that the teacher's responsibility is to "establish a mathematical community in the classroom where everyone's thinking is respected and in which reasoning and discussing mathematical ideas and meanings is the norm" (p. xiv). This means that in the case of learning via problem solving, both the students and the teacher take on roles that are potentially different from what they are used to. In their review of research on problem solving, Stein, Boaler, and Silver (2003) document many advantages of using this approach to teach mathematics: equal or better student performance on standardized tests, more positive and broader student attitudes about mathematics, and more equitable student performance with no achievement differences along social class or gender lines. However, the authors also point out the difficulty of teaching mathematics via problem solving, and state "much remains to be learned about how to teach mathematics through problem solving in ways that enhance the learning of all students" (p. 254).

Even though the mathematics education community posits that teaching via problem solving is a more effective way to teach than teaching via telling (CBMS, 2001, 2012; Marcus

& Fey, 203), the instructional approach is not being widely used to teach PTs preparing to be primary mathematics teachers. Additionally, there is little support within mathematics departments for MTEs who are interested in learning to teach via problem solving (Masingila, Olanoff & Kwaka, 2012).

Engaging Prospective Primary Teachers in Learning via Problem Solving

In teaching and learning via problem solving, problems are valued not only as a purpose for learning mathematics, but also as a primary means for doing so. The teaching of a mathematical topic begins with a problem situation that embodies key aspects of the topic, and mathematical techniques are developed as reasonable responses to reasonable problems (Schroeder & Lester, 1989).

There are several key aspects that have been central to our efforts to design courses for prospective primary teachers: (a) *"big mathematical ideas"* serve as important organizers for the course; (b) *cooperative learning* is an essential part of regular instruction; (c) *reflective writing* is considered a useful tool to help students make strong connections among the mathematical ideas they encounter and consolidate their mathematical understanding; (d) *assessment* is a continuous activity engaged in by both the teacher and students to the extent that it becomes a natural part of instruction; and (e) the new view of instruction requires that both the *teacher and students assume different roles* in daily classroom activities.

Big Mathematical Ideas

The term "big idea" refers to those themes that pervade several areas of mathematics and which serve to make connections among mathematics topics. These big ideas, then, are recurring, unifying themes in mathematics. With respect to identifying KEY big ideas to emphasize in the activities, we decided that to be a big idea an idea should:

1. Help students make connections among what may for them seem like unrelated topics,
2. Help students make connections between the world of mathematics and the real, everyday world, and
3. Provide ample opportunities for students to develop a greater appreciation for and understanding of the beauty of mathematics and mathematical activity.

Our own thinking, guided by a consideration of the ideas expressed in other researchers' writing, has led to a conceptualization of the big ideas in terms of three dimensions: *structures, actions*, and *tactics*. Each dimension contains big ideas that exemplify a fundamental theme, process, or aim of mathematical activity.

Structures include mathematical ideas and entities such as equivalence, function and relation, measurement, number and operation, shape and space, and pattern and order, among others. The structures identified here are almost arbitrary; many other (perhaps better) structures could have been chosen. This is consistent with the notion that the specific big ideas are not nearly as important for these courses as the idea that there are unifying themes that pervade many branches of mathematics.

The *actions* refer to the sorts of activities that individuals engage in when they are doing mathematics and, as often as not, they are the goals of mathematical activity (e.g., creating a generalization, developing a useful mathematical model). These actions help distinguish mathematical activity from other kinds of intellectual activity. Among the actions that seem to be particularly relevant for courses for prospective teachers are verifying, generalizing, modeling, representing, and composing/decomposing.

The *tactics* dimension includes tools that help the individual do mathematics. More specifically, tactics assist the person doing mathematics in implementing mathematical *actions*. The four tactics we have chosen are conjecturing, creating and using algorithms, using problem-solving strategies, and developing and using appropriate language and symbolism, but there may be other equally as important tactics.

Cooperative Learning

The philosophy behind the appropriate use of the materials in our courses requires that students—rather than the teacher— must bear the primary burden for making sense of mathematical ideas, for constructing mathematical arguments, and for providing mathematical explanations. Shifting the burden in this way is accomplished by organizing each class session in a very different way from the usual university mathematics class: During much of each class period students work cooperatively in small groups to wrestle with problems that challenge them, to develop new and deeper understandings of fundamental mathematical concepts, and to talk about their new ways of thinking.

The role of the instructor in class is quite different from in more traditional mathematics classes. Rather than preparing a lecture, the instructor is usually responsible for a three-part lesson: (a) providing a brief introduction to the day's activities, (b) circulating about the room while students work in small groups and making appropriate comments to the groups, (c) leading wrap-up whole-class discussions where various groups share their thinking about the problem and the instructor helps everyone consolidate their thinking about their work. This type of wrap-up often occurs several times throughout the class period, as well as at the end of each class.

Before students begin work in their groups, the instructor should talk briefly to the entire class, introducing the activity of the day, explaining any new terminology or special instructions, and indicating how this activity fits into the larger context of the course. Note that this introduction is not a time for telling how to solve the problem at hand: ***Solving the problem is the task of the students working in their small groups.*** Students will probably be frustrated at first with small group work because they are accustomed to being told by their teachers exactly what to do. By contrast, the problem-solving activities challenge students to do their own thinking and the instructor's role is merely to introduce the activity and to guide students to discover their own solutions.

As the instructor circulates around the room while students are working in small groups, he or she must assume the role of question asker, problem poser, and careful listener; the students are the problem solvers and explainers, not the instructor. No matter how many times the instructor tells the students that *they* must be the problem solvers, they will only believe it if the instructor demonstrates it by his or her actions in the classroom.

Reflective Writing

Reflective thinking occurs both inside and outside the classroom. Inside the classroom, students reflect as they work to understand a problem, evaluate their solution processes, decide if their solutions make sense, justify their generalizations, connect mathematical concepts, understand a problem solution different from their own, extend a problem, monitor their thinking processes, and communicate their ideas to other students and the teacher. When students are encouraged and expected to be reflective in their work, they become better at thinking reflectively, their understanding of the content improves, they are more creative and insightful in their problem solving, their motivation for learning increases, and they begin to look for, and make, connections between mathematical concepts (Borasi & Rose, 1989).

Outside of the classroom students can continue their reflective activity through reflective writing. Reflective writing benefits students in four ways: (a) therapeutic value, (b) increased learning of content, (c) improvements in learning and problem-solving skills, and (d) change in one's conception of mathematics. Reflective thinking and writing are meaning-making processes that involve the student in actively building connections between what they are learning and what they already know.

Assessment

Assessment is perhaps the most worrisome aspect of any mathematics course for both the instructor and students, due in part to the fact that assessment is commonly associated (often exclusively) with grading and in part to the all-too-often mysterious nature of the instructor's assessment practices. We encourage the instructor to explain carefully to the students the various sources of data to be used for grading. These sources of data might include class participation, tests and quizzes, homework, reflective writing, and group projects. From the confluence of these data sources, the instructor assigns each student a grade that indicates the extent to which he or she has reached the goal of the course, namely, to develop good understanding of key mathematical ideas and to be able to communicate these ideas clearly and efficiently to others.

Yet instructors should not think of assessment only in terms of assigning grades. Another just as important reason for assessment is to help the instructor build an accurate mental picture of the understandings held by students and to enable him or her to adjust instruction accordingly. Thus, assessment is an ongoing process in the classroom. For example, whenever the instructor is circulating throughout the room during small group work, he or she should be assessing the progress of the various groups, trying to get a picture of student understandings, and making mental plans so that the wrap-up discussion or the next class session may be orchestrated to help students deepen their understandings. Another source of assessment data for the instructor is the students' reflective writing. By reading students' writing, an instructor gets additional insight into which topics have been understood and which need more attention or a more focused discussion.

Still another reason for assessment is to indicate to students what is considered important. Because being able to communicate about mathematics is an important goal of the course, instructors must allow sufficient time for students to talk about mathematics and to write about it. And they must offer thoughtful reactions to students' communicative efforts, so that the students can see that their efforts to explain their ideas are valued.

Because teaching via problem solving requires a different type of instructional approach and different expectations of students, it also demands new ways of assessing student growth. In particular, it requires using more than just tests and quizzes for assessment. For example, if one accepts the position that assessment should be embedded in classroom work and should be aligned with classroom methods, then it makes sense that group assessment would be used in a class where group problem solving is the norm. A second reason for using alternative assessment techniques is that use of a variety of methods can provide a much richer vision of what students think, believe, and know than that obtained from any single method alone. Finally, in a course for prospective teachers, it is especially important that use of alternative assessment be modeled.

Instructor and Student Roles

The instructor's role in a course emphasizing learning mathematics via problem solving is drastically different from the role he or she assumes in a more traditional, lecture-based course. Students' must accept different roles also! No longer are they allowed to sit passively and simply "absorb" information transmitted to them by the instructor. Students are expected to listen to, respond to, and question the teacher and one another. They should also be reflective thinkers to become aware of how they themselves learn mathematics. Validity of particular representations and solutions should be determined by mathematical evidence and argument, whether working in large or small groups, and not by seeking the "right" answer from the teacher. It is probably inevitable, then that some student frustration will arise in this environment because of prior student beliefs about the nature of mathematics and expectations about the proper role of the teacher. It is ultimately the task of the student to try to make sense of her or his mathematical experiences.

We realize, however, that role changes of this sort are not easy to make. One reason for the difficulty is that many instructors feel comfortable being "in charge" (of both the content to be taught and the students) and may have painstakingly developed lecture notes over the years that they are loath to give up. There is also the matter of the teacher needing to learn how to adopt an appropriate balance, sensing when to intervene and re-direct student exploration and when to allow the student to stumble along. A teacher who gives detailed directions may be sending the message that students are to be dependent on her for all knowledge. But a teacher who gives almost no direction increases the possibility of student frustrations rising to a debilitating level. Thus, the teacher's role is that of a guide, not that of an authority. The teacher chooses which problems and activities to use as a means for introducing material and guides the discussion of these problems, but the teacher does not pronounce solutions. This is fundamentally different from what has been considered appropriate teacher behavior in the past.

At the same time, college students have experienced years of training in which the teacher was the authority and the teacher's word was as close to the "truth" as was possible. As a result, many college students expect the teacher to tell them what to learn and how to learn it. That is, they have not developed autonomous learning behaviors that they will one day hope to develop in the children they will teach.

A heavy reliance on cooperative learning removes the teacher as the authority figure and minimizes the possibility of students blindly emulating the teacher's modeled techniques and solutions. Students are forced into helping each other develop their own deeper understanding of mathematical principles and mathematical autonomous learning behaviors.

The overarching responsibility of the teacher is to establish a mathematical community in the classroom where everyone's thinking is respected and in which reasoning and discussing mathematical ideas and meanings is the norm. Within this community, the teacher's insightful questioning can play an important role in stimulating student thinking so that there are opportunities for students to examine and question their beliefs about mathematics, to have their misconceptions challenged, and to seek clarifications, strategies, and verifications without direct teacher intervention.

Conclusion

The importance of primary teachers having deep and strong understandings of foundational mathematical ideas cannot be overstated. Research and our own experience have shown that engaging prospective primary teachers in learning mathematics via problem solving is a way to support them in developing these strong understandings. We have used big mathematical ideas, cooperative learning, reflective writing, a variety of assessments, and different roles for instructors and students to engage prospective primary teachers in learning via problem solving.

References

Ball, D. L., & Bass, H. (2000). Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics. In J. Boaler (Ed.) *Multiple perspectives on the teaching and learning of mathematics* (pp. 83-104). Westport, CT: Ablex.

Conference Board of the Mathematical Sciences (2001). *The mathematical education of teachers*. Washington, D.C.: American Mathematical Society.

Conference Board of the Mathematical Sciences (2012). *The mathematical education of teachers II*. Washington, D.C.: American Mathematical Society.

Darling-Hammond, L., & Snyder, J. (2000). Authentic assessment for teaching in context. *Teaching and Teacher Education, 16*, 523-545.

Grouws, D. A. (2003). The teacher’s role in teaching mathematics through problem solving. In H. L. Schoen (Ed.), *Teaching mathematics through problem solving: Grades 6-12* (pp. 129-141). Reston, VA: National Council of Teachers of Mathematics.

Henningsen, M., & Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education*, *28*(5), 524-549.

Hiebert, J., & Wearne, D. (2003). Developing understanding through problem solving. In H. L. Schoen (Ed.), *Teaching mathematics through problem solving: Grades 6-12* (pp. 3-13). Reston, VA: National Council of Teachers of Mathematics.

Hill, H. C., & Ball, D. L. (2004). Learning mathematics for teaching: Results from California's professional development institutes. *Journal for Research in Mathematics Education, 35,* 330-351.

Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42,* 371-406.

Lesh, R., & Zawojewski, J. (2007). Problem solving and modeling. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 763-804). Charlotte, NC: Information Age Publishing.

Lobato, J., Clarke, D., & Ellis, A. B. (2005). Initiating and eliciting in teaching: A reformulation of teaching. *Journal for Research in Mathematics Education, 36*(2), 101-136.

Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States*. Mahwah, NJ: Lawrence Erlbaum.

Marcus, R., & Fey, J. T. (2003). Selecting quality tasks for problem-based teaching. In H. L. Schoen (Ed.), *Teaching mathematics through problem solving: Grades 6-12* (pp. 55-67). Reston, VA: National Council of Teachers of Mathematics.

Masingila, J. O., Lester, F. K., & Raymond, A. M. (2011). *Mathematics for elementary teachers via problem solving: Student activity manual* (3rd ed). Acton, MA: Copley Custom Textbooks.

Masingila, J. O., Olanoff, D. E., & Kwaka, D. K. (2012). Who teaches mathematics content courses for prospective elementary teachers in the United States? Results of a national survey. *Journal of Mathematics Teacher Education, 15*(5), 347-358.

Polya, G. (1957). *How to solve it* (2nd ed.). Princeton, NJ: Princeton University Press.

Schroeder, T. L., & Lester, F. K. (1989). Developing understanding in mathematics via problem solving. In P. R. Trafton, & A.P. Shulte (Eds.), *New directions for elementary school mathematics* (pp. 31-42). Reston, VA: National Council of Teachers of Mathematics.

Simon, M. A. (2000). Research on the development of mathematics teachers: The teacher development experiment. In A.E. Kelly & R.A. Lesh (Eds.), *Handbook of research design in mathematics and science education*. Mahwah, NJ: Lawrence Erlbaum.

Stanic, G. M. A., & Kilpatrick, J. (1989). Historical perspectives on problem solving in the mathematics curriculum. In R. I. Charles, & E. A. Silver (Eds.), *The teaching and assessing of mathematical problem solving* (pp. 1-22). Reston, VA: National Council of Teachers of Mathematics.

Stein, M. K., Boaler, J., & Silver, E.A. (2003). Teaching mathematics through problem solving: Research perspectives. In H.L. Schoen & R.I. Charles (Eds.), *Teaching mathematics through problem solving: Grades 6-12*. Reston, VA: National Council of Teachers of Mathematics.

EFFECT OF PRACTICAL WORK IN PHYSICS ON THE STUDENTS' PERFORMANCE IN PHYSICS

Augustine N. Muchai
Murang'a University College
ngetheaugustine@yahoo.com

Nicholas W. Twoli
Kenyatta University
nicholastwoli@yahoo.com

Science knowledge and skills are being regarded as very important in national development. Physics as one of the science subjects is useful in developing the upcoming engineers and medical doctors for any nation. An important component of the knowledge in these professions are skills which are acquired mainly through practical situations. This study explored the effect of practical work in physics among secondary school students in central part of Kenya. A quasi-experimental design was applied in the study. The experimental group was taught using a practical approach for one term while the control group followed the conventional or traditional approach. A pre-test was given to both groups at the start to determine their equivalence in ability. After the 12 weeks, a post – test, which was a physics achievements test, was administered to both groups. The results revealed that there was a significant difference in performance between the control and the experimental group, with the experimental group performing a lot better ($\bar{x}$ =30.70) than the control group ($\bar{x}$ =27.25). The results were significant at ($\bar{x}$ =0.05) level. This outcome showed that practical approach does reinforce the understanding of concepts in physics and thus boosts achievement.

Keywords: Practical, Physics, Performance, Student

Introduction

Physics is a core subject in science and technology since it enlightens the essence of natural phenomena and helps people to understand the rapidly technological changing society (Zhaoyao, 2002; Jucevicience & Karenauskaita, 2004). Despite the importance of physics in the scientific and technological development, it appears physics education has been facing various challenges. First, the enrolment in Physics courses at all levels is low in many African countries (Amunga et al., 2011a). Many reasons are advanced for this discrepancy which include inadequate lower level preparations, weak mathematics background, limited resources lack of job opportunities outside the teaching profession, inadequate teacher qualification as well as possession of below standard pedagogical content knowledge (Semela, 2010).

Boyo (2010) viewed Physics as a course of study that is perceived to be experimental and that almost all aspect of life science, both living and non-living has something to do with Physics, ranging from Engineering to Mathematics, Biology and Chemistry. The understanding of practical Physics may help students to accommodate Physics concepts. According to Pohl, a German Physicist, Physics is a science based on experiences and whose facts are found (Michael & Klaus-Peter, 2012). Practical work may be considered as engaging the learner in observing or manipulating real or virtual objects and materials (Millar, 2004). Practical knowledge, according to James (2000), refers to that knowledge that is connected with reality rather than ideas and theories. It is the knowledge acquired through the practical approaches that assist one to carrying out scientific investigation and teaching. Appropriate practical work enhances learners' experience, understanding, skills and enjoyment of science. Practical work enables the students to think and act in a scientific manner. Practical work of a more open-ended, investigative kind can develop students' tacit knowledge of scientific enquiry (Millar, (2004). The scientific method is thus of great importance in acquiring knowledge. Laboratory investigation holds significant promise for being able to support conceptual and epistemological learning when favorable conditions are put in place for students (Bell, 2005). Thus, the laboratory has been given a central and distinctive role in science education, and this explains why science educators have suggested that rich benefits in learning accrue from using Laboratory activities (Hofstein & Lunetta, 2004). Laboratory experiences have been purported to promote central science education goals including the enhancement of students' understanding of concepts in science and its applications; scientific practical skills and problem solving abilities; scientific ‘habits of mind’; understanding of how science and scientists work; interest and motivation (Hofstein & Mamlok-Naaman, 2007).

This then means that learning Physics is incomplete without the acquisition of practical skills in Physics. Physics, according to Ndupu & Okeke (2007), is a practical subject and every scientific discovery has been made as a result of experimental investigation. If students are to understand the theoretical aspect of Physics taught in the classroom to help to translate to real life situations, they must master the techniques of practical Physics. Research has shown that the effect of demonstration makes a significant contribution to general and conceptual understanding of the concepts of Physics in cases when students make hypotheses and discuss them, when they create experiments, verify their hypothesis and make conclusions (Svedružić, 2008). The importance of Physics was made the ministry of education to make it a compulsory subject for all students at Form One and Form Two in Kenyan Secondary schools. At the end of Form Two, they have to make a choice; to continue with the subject or drop out. The enrolment at after a compulsory state is low and one reason for this is that physics performance is poor. Several studies have been done to address the problem. Several interventions have been put in place to address the identified challenges. They include in servicing of Physics teachers through SMASSE, provision of teaching resources through KESSEP, campaigns on the importance of Physics (Nderitu, 2009), which have not been satisfactory. This explains the importance to come up with this study.

Methodology

The study adapted a quasi-experimental pre-test post-test design. It involved four schools in two categories: A and B. there were two schools from category one and two in category B. Each category had one experimental and one control group. The experimental groups were taught using the practical approach, while the control groups were taught using the conventional method of teaching. This was done for one full term of three months. Then the post-test questionnaires were administered and the results analyzed. The rubrics for the design are presented in Table 2.1.

Table 2.1 Designs for the Study

Experimental group	**R**	**O_1**	**X**	**O_3**
Control group	R	O_2	X	O_4

Where X = Treatment and ◯ = No treatment

O_1 pre-test result for the experimental group
O_2 pre-test result for the control group
Q_3 post-test result for the experimental group
O_4 post-test for the control group

The study was located in secondary schools of Murang’a East Sub-County. The district has 28 secondary schools. The district was chosen due to the low enrolments in Physics and also the low students’ achievement in the subject in KCSE. The target population was the secondary school students in Murang'a East Sub-County. The unit of analysis was the Form Two students in secondary schools. A list obtained from the County Education Office indicate that the district has 28 secondary schools which are categorized as follows: (a) Two privates schools, (b) one national school, (c) one County school, (d) one extra county school, and (d) twenty three day schools.

Sample and Sampling Procedures

Purposive sampling was used to select the study sample. This was to ensure that the prerequisite skills and the knowledge level of the students in Physics is almost the same. Also one of the key resource that was required for practical work as a method of instruction is availability of a relatively functional laboratory with basic laboratory fittings. The sample was drawn from the District schools' category. This was because of low enrolments and achievement in Physics. Stratified sampling technique was used to select the sample. The District schools were classified into two; those with a mean score of between 4-5 and those with a MSS of below 4 in the 2012 KCSE results. From each stratum, two schools were purposively chosen totaling to a sample size of four schools. Sampled schools were far from each other to minimize interaction. In addition, they had the same MSS score per the KCSE results of 2012. They also had the same characteristics in terms of entry behavior and infrastructure. This ensured homogeneity of the sampled schools. They were also mixed secondary schools (boys & girls) so as to capture the gender component. One school from each category formed the experimental group while the other the control group.

Research Instruments

There were two instruments used in this study, the pre-test and the post-test. Pre-test was used to measure the performance of the learners in Physics of both the experimental and the control group before the treatment was administered. This aimed at ensuring that, both groups were of relative same ability in performance in Physics. The achievement was composed of 10 open-ended questions, which took 40 minutes.

Post-test used Students Achievement Test (SAT) that was administered to both control and experimental students in a staggered manner throughout the term. Specific tests evaluating the work done in each topic was given at the end of the topic. These was graded and eventually compiled at the end of the term.

A pilot study was undertaken for purposes of validation and testing the reliability of the research instruments that were used. Two district schools in the neighboring Kirinyaga County were purposively chosen for piloting so as to capture the key characteristics of the study. The pilot study helped to identify and rectify the mistakes in set questions. It also helped to determine the suitability and the appropriateness of the language used in both pre-test and post-test. It also helped in making any adjustment to the practical set up and write-ups. The test items were constructed using the Form Two syllabuses were adopted from KNEC past papers. The reliability of the assessment tests was determined using the split-half method. Correlation between the two halves was determined, using Specimen – brown prophecy formula to estimate the reliability of the whole test. The Specimen–brown prophecy formula adopted from Elsinga et al (2012) was used.

$$PXX^{11} = \frac{2pxx^1}{1 + pxx^1}$$

Where PXX^{11} is the reliability co-efficient for the whole test and PXX^1 is the split half correlation. A value of 0.7 and above was considered reliable. A reliability coefficient of 0.83 and o.87 were obtained for the Pre-test and posttest tests respectively.

Data Collection Methods and Procedures

At the beginning of the term school the four groups were given a standard achievement test that served as a pre-test. This pre-test was based on Form One Physics syllabus. The results from this test were analyzed to ascertain the relative performance levels of both the experimental and the control groups. At the beginning of the study, the teachers who were involved with experimental group in the study underwent training exercise to familiarize themselves with the practical approach to be used. The students were taught using the practical approach for the experimental group and the conventional method for the control group for a period of one term. The topics were selected from the syllabuses as stipulated by Kenya Institute of Curriculum Development.

During the term the teachers were oriented on how to use the practical approach in their teaching method. The experimental group instructional technique emphasized practical work when teaching the topics. During the practical activity the students were actively involved in setting the equipment and apparatus used in the laboratory. After each experiment, there was an intensive class interaction. Experimental procedure, data collection, manipulation and analysis procedures were reviewed in the class before the students were required to complete writing the laboratory report. The students' achievement tests (SAT) were administered to the respondents in a staggered manner throughout the term. Specific tests evaluating the work done in each topic was given out at the end of each topic. This formed the post-test scores.

The data obtained from both pre and posttests were analyzed using descriptive and inferential statistics. This involved the use central tendency (mean, variance and standard deviation). To determine whether there were significant differences between the control and experimental groups, in terms of performance in the pre-test and posttests and between groups, a t-test was computed. The results were tested at a significance level $\alpha = .05$.

Results and Discussion

Demographic Characteristics

The study ensured the gender distribution of the students (Table 1). For the purpose of this study the schools were categorizes into two groups A and B. Groups A were those schools with a MSS of between 4-5 and group B schools with a MSS of below 4 in the 2012 KCSE results. From each stratum two schools were purposively sampled totaling to four schools.

Table 1: Gender Distribution of the Respondents

School		Female	Male	Total
Experimental A	N	24	21	45
	%	12.8	11.2	23.9
Control A	N	29	19	48
	%	15.4	10.1	25.5
Experimental B	N	26	20	46
	%	13.8	10.6	24.5
Control B	N	26	23	49
	%	13.8	12.2	26.1
Total	**N**	**105**	**83**	**188**
	%	**55.9**	**44.1**	**100**

The majority 105 (55.9%) of the respondents were females while 83 (44.1%) were males. This shows some gender disparity. Majority of the mixed day and boarding schools from which the sample was drawn have more girls than boys (Murang'a County Education Office, 2014). This ratio seems to favor the lower classes but is a different matter at higher levels.

Effects of Practical Work in Physics on Student's Performance in Physics

In order to establish the effects of practical work in Physics on student's performance in Physics, the respondents group was first subjected to a pre-test Physics achievement test followed by treatment for the experimental groups and the post-test was administered. This section presents the student's performance of each of these tests. The results of the students' performance in the pre-test are presented in table 2.

Table 2: Mean Scores of the Pre-Test per Group

Group (School)	N	Mean ($\bar{\mathbf{x}}$)	Std Deviation (SD)
Experimental A	45	27.73	7.817
Control A	48	27.17	5.513
Experimental B	46	25.24	8.239
Control B	49	25.31	7.177
Total	**188**	**26.35**	**7.266**

Table 2 shows that the experimental school A, (mean = 27.73) SD = 7.817) performed better than control school A (mean = 27.17 SD = 5.513) while control school B (mean = 25.31, SD =7.177) performed better than the experimental school B. In additional school set A performed better than school set B because set A had a higher entry behavior than set B. An independent t-test was then computed to determine if there were any significant differences in each set. The results are presented in table 3.

Table 3: Comparison of Mean Scores of Control and Experimental School

School	N	t-test ($\bar{\mathbf{x}}$)	t	df	Sig (2-tailed)
Experimental A	45	27.73	4.06	91	.686
Control A	48	27.17			

Table 3 shows an independent t-test consulted t (91) = 4.06, ρ = .686, ∝ = .05 revealed that there is no significant mean difference between experimental and control schools in set A in the performance of the pre-test. An independent t-test was also conducted for the schools set B. The results are presented in table 4.

Table 4: Comparison of Mean Scores of Control and Experimental School

School	**N**	**t-test for Equality of Mean** ($\bar{\mathbf{x}}$)	**t**	**df**	**Sig (2-tailed)**
Experimental B	46	25.24	.042	93	.966
Control B	49	25.31			

The results show an independent t-test conducted, t (93) = .042, ρ = .966, ∝ = .05 and revealed that there is no significant mean difference between the experimental and control schools in set B in the performance of pre-test. This means that the study started off with equivalent groups that are an important requirement for the study.

The experimental group was then exposed to practical approach method of teaching for 12 weeks while the control groups were taught using the conventional or traditional methods. After exposure the post-test was administered. The results are presented in table 5

Table 5: Students Performance in the Post-Test

School	N	($\bar{x}$)	(SD)
Experimental A	45	34.60	9.521
Control A	48	27.25	5.526
Experimental B	46	30.70	7.586
Control B	49	27.04	6.377
Total	**188**	**29.08**	**7.918**

The results show that the experimental group performed better than the control group in the post – test. The table shows that the experimental school A ($\bar{x}$ = 34.60 SD = 9.521) performed better than the control school A ($\bar{x}$ = 27.25 SD = 5.526). In addition, experimental school B ($\bar{x}$ = 30.70 SD = 7.586) performed better than the control school B ($\bar{x}$ = 27.04 SD = 6.377). An independent t-test was then computed to determine if there was any mean significant difference between the control and experimental groups from each set of school.

The study concluded that the students' exposed to practical work in Physics performed better than those taught through conventional method. These results are supported by a number of researchers. Wasanga (2009) also found a similar correlation between practical work and understanding of science subjects which leads to improved performance in achievement tests. Amunga et al (2011a) have demonstrated that practical work makes the students take learning science better. The determination to unravel the requirements of the objectives of the practical task leads the learners to take charge of the learning situation and to develop an insight in the challeges of the tasks involved in the practical work.

Lunetta et al (2007) have suggested that engaging in scientific practical work provides simulation experiences which situate students learning in states of inquiry that require heightened mental and physical engagement. This engagement leads to better understanding and improved performance. However, Hodson (1991) casts cautionary aspersions on the relationship between practical work and performance in secondary schools.

The current study also agrees with Freeman (2007) who found out that girls who had taken part in laboratory work intervention improved their Science achievement compared with the girls who had received traditional teaching with no or little laboratory component. The study reports that laboratory work demanded active participation by all students, and it was this participation that was responsible for the girls' higher achievements scores. These results concur with the findings of Wachanga, (2002b) in his study on effects of cooperative class experiment teaching method that boys and girls performed equally well when exposed to this instructional strategy. According to Millican, Richards and Mann (2005) physics is an experimental subject. General principles and concepts are more easily understood if they are demonstrated in the laboratory. Laws and relationships are more fully appreciated if the student investigates and verifies them at the laboratory bench.

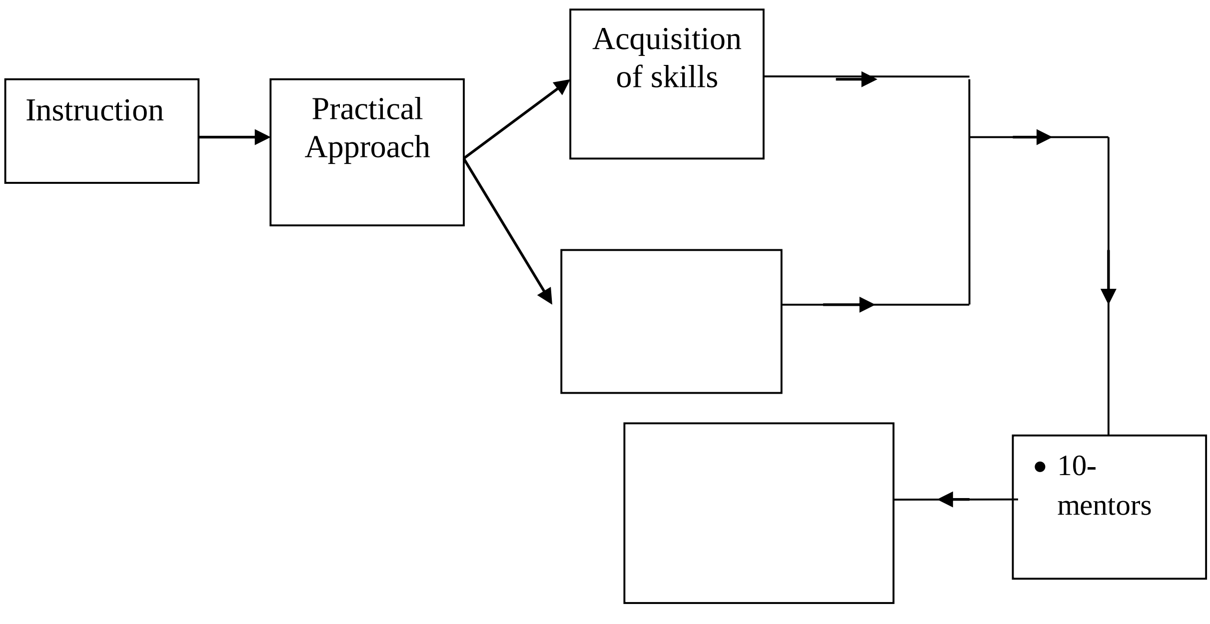
Table 6: Independent t-Test for the Post-Tests

			T-Test For Equality of Mean			
Set	School	n	($\bar{x}$)	t	df	Sig (2-tailed)
A	Experimental A	45	34.60	4.588	91	.000
	Control A	48	27.25			
B	Experimental B	46	30.70	2.548	93	.012
	Control B	49	27.04			

The post-test was subjected to t-test for further analysis. Table 6 shows that there was a significant mean difference between experimental school A ($\bar{x}$=34.60) and control school A ($\bar{x}$=27.25), t (91) = 4.588, ρ= .0001, $\propto$ = .05. In addition there was a significant mean difference between the experimental school B ($\bar{x}$=30.70) and Control B ($\bar{x}$=27.04), t (93) = 2.548, ρ = .012, $\propto$ = .05.

Conclusion

The study concluded that the students' exposed to practical work in Physics performed better than those taught through conventional method. This can be explained using the following model.



The study shows that practical approach in teaching physics brings a lot of benefits to learners. First it gives opportunity to learners to acquire scientific skills that can include a range of process skills. It has been noted that such skills support learning in science. The other benefit is that practical approach reinforces or clarifies a number of concepts in physics. The resultant of these contributions is improved performance in the subject and a good performance is likely to lead to a higher enrolment of students. This is a picture that many science education stakeholders would welcome.

The study ends with a general recommendation that teachers of physics and science in general should be encouraged by their schools and ministry to emphasize practical approach in their instruction. This is only possible if teachers are facilitated in terms of resources and running in-service courses.

References

Amunga, J. K., Musasia, M. A., & Musera, G. (201l). Disparities in the Physics Achievement and Enrolment in Secondary Schools in Western Province: Implications for Strategy and Renewal, *Problems of Education in the 21st Century,* 31(31), 18-32, ISSN: 1822- 7864.

Australia: ASEE/AaeE.

Bell, P. (2005). *The school science laboratory: Considerations of learning, technology, and scientific practice*. Paper prepared for the National Academies Board on Science Education, High School Labs Study Committee. Available:http://www.nationalacademies.org/bose/High_School_Labs_Presentation_P Bell.html.

Boyo, A. (2010). *Identifying Problems Associated with Studying of Physics in Lagos State, Nigeria.* Retrieved on 2nd September, from http://www. wcpsd.org/ posters/education/Boyo_Adenike_1.pdf

Freeman, M. P. (2007). The Influence of Laboratory Instruction of Science Achievement and Attitude towards Science across Gender Difference. *Journal of Women and Minorities in Science and Engineering, 8*, 191-200.

Hodson, D. (1991). Practical work in science: time for a reappraisal, *Studies in Science* Education, 19, 175—184.

Hofstein, A. & Lunetta, V. (2004). *The laboratory in science education:* Foundations for the Twenty-First century. Science Education, 88, 28–54.

Hofstein, A., & Mamlok-Naaman, R. (2007).The laboratory in science education: The state of the art. *Chemistry Education Research and Practice, 8: 105–107*.

Juceviciene, P., & Karenauskaite, V. (2004). *Learning environment in Physics:* the context of double paradigm shift, Paper presented at the European Conference on Educational Research, University of Crete, 22-25 September.

Lunetta, V. N., Hofstein, A., & Clough, M. P. (2007). *Learning and Teaching in the School Science Laboratory: An Analysis of Research, Theory, and Practice.* In S. K. Abell & N. G. Lederman (Eds.), Handbook of Research on Science Education (pp. 393–441). New York & London: Routledge.

Michael, V., & Möllmann, K. (2012). Low cost hands-on experiments for Physics teaching. *Latin-American Journal of Physics Education, Vol. 6(1):3-9*.

Millar, R. (2004, June 3). The role of practical work in the teaching and learning of science. Paper presented at the "*High School Science Laboratories:* Role and Vision" Meeting, Board on Science Education, National Academy of Sciences. Washington DC.

Millican, G., Richards, P., & Mann, L. (2005). *The engineering link project: Learning about engineering by becoming an engineer*. In Radcliffe, D. and Humpries, J. (Eds.),Proceedings of the 2005 ASEE/AaeE 4th Global colloquim.Sydney,

Nderitu, M. K. (2009). *Determinants of Enrolment and Performance in Physics in Selected Secondary Schools in Murang'a District Kenya*. Unpublished Master of Education Kenyatta University .Nairobi.

Semela, T. (2010). Who is joining Physics and why? Factors influencing the choice of Physics among Ethiopian university Students, *International Journal of Environmental & Science Education,* 5(3), 319-340.

Svedružić, A. (2008). *Demonstration in teaching Physics. Metodika, 17(2): 442-450*.

TEACHERS' PERSPECTIVES TOWARDS USE OF TECHNOLOGY: THE CASE OF GEOGEBRA IN TEACHING MATHEMATICS IN KENYA

Irene Mwingirwa Mukiri
Kenyatta University
mukiriii@gmail.com

Marguerite Miheso-O'Connor
Kenyatta University
miheso.marguerite@ku.ac.ke

David Khatete
Kenyatta University
khatetedavid@yahoo.com

This study looks at GeoGebra as a type of technology and assesses teachers' perspectives towards training and use of GeoGebra as a tool to enhance learning of mathematics. This paper is reporting the findings of a larger study that was conducted in Kajiado County in Kenya on GeoGebra use in teaching Secondary School Mathematics. The study sought to relate teachers' perceptions towards uptake of technology and the actual uptake of technology as indicated by the Diffusion Innovation Model. The findings after training sessions with the mathematics teachers showed that the mathematics teachers were willing to use GeoGebra in their classes. The teachers said that among all topics, they felt that Geometry was the most complicated to teach and that GeoGebra was a welcome solution to this problem. Teachers' responses indicated that GeoGebra is useful for teaching and learning Mathematics and that it would help learners grasp concepts in Geometry.

Keywords: GeoGebra, Geometry, technology, Secondary Mathematics

Introduction and Literature Review

Some of the main areas of study in secondary school mathematics include Algebra, Geometry, Calculus, Trigonometry, Probability and statistics. Technology has been used in various areas in mathematics including Algebra (Wilson 2000), in statistics (Abrahamson & Wilensk, 2007) and in Geometry (Cobo, Fortuny, Puertas, & Richard 2007). Some of the computer software available for teaching and solving mathematical problems include, Spreadsheets, Dr. Geo, dynamic geometry software, Matlab, and GeoGebra among others. Since it is not possible to study all these available computer applications at the same time, the study will look at GeoGebra and how it can be useful in the Kenyan Mathematics curriculum, specifically in the area of Geometry.

GeoGebra is a community-supported open-source mathematics learning environment that integrates multiple dynamic representations, various domains of mathematics, and a rich variety of computational utilities for modeling and simulations. Invented in the early 2000s, the aim of GeoGebra was to implement in a web-friendly manner the research-based findings related to mathematical understanding and proficiency as well as their implications for mathematics teaching and learning. One can easily download the software on (http://www.geogebra.org) and hence use it in teaching. A mathematically competent person has the ability of coordinating various representations of a mathematical idea in a dynamic way and further gain insight into the focal mathematical structure (Bu, 2011). This therefore makes GeoGebra very important to a teacher of mathematics as they have the relevant competence in mathematics. In the fields of learning sciences and instructional design there has been several highlights by researchers on the theoretical and practical implications of *mental models* and *conceptual models* involving complex human learning (Milrad et al, 2003; Seel, 2003). GeoGebra comes in as an important tool to enhance visualization in Geometry.

Geometry has been defined by various scholars; "Geometry is a complex interconnected network of concepts, ways of reasoning, and representation systems that is used to conceptualize and analyze physical and imagined spatial environments" (Battista, 2001a). Geometry is also defined as a branch of Mathematics that is concerned with shapes, sizes, relative position of figures and the properties of space. Geometry is the branch of mathematics concerned with lengths, areas and volumes (En.wikipedia.org/wiki/geometry). Geometrical definitions have to do with space and shape. Hence when defining a geometrical shape, properties such as angles and measurements are used. According to Clements and Battista (1990), "underlying most geometric thought is spatial reasoning which is the ability to see, inspect and reflect on spatial objects, images, relationships and transformations". In the process of teaching topics and concepts involving Geometry, the teacher expects his/her students to be able to visualize figures, shapes and planes that many not be very obvious to the student. This concept is what makes geometry unique and difficult to learn and teach. This is because spatial ability is not easy for all students. Complications experienced in teaching and learning of Geometry as sited in the second handbook of research on mathematics teaching and learning, Battista (2007), include:

1. Conception affects perception since what one sees is affected by what one knows and conceives.
2. Diagrams as data or representations. It is through analyzing the geometrical diagrams that concepts are derived. According to (Chazan & Yerushlmy, 1998), "diagrams are aids for intuition and are not necessarily the objects of study themselves" (p. 70). The diagrams used in mathematics are representations of the actual object. In teaching the concepts of geometry therefore, the teacher is faced with the task of helping learners 'see' the objects represented in the image and further derive some meaning from it.

Problem Statement

Looking at the Kenyan Secondary school mathematics, some of the topics that fall under this broad branch of Mathematics. Geometry includes: area, volume, geometrical constructions and trigonometry among others. According to Kenya National Examinations Council (KNEC) reports, Mathematics' mean scores have remained low over the years, despite the technological advancement. There has been development of technologies to enhance teaching and learning of Mathematics over the years but this has not changed. A closer look at the KCSE reports, questions recorded as being difficult were mostly seen to be from the broader category of mathematics that is Geometry.

Table 1.1 Number of Questions Listed as Difficult in KCSE

Year of Exam	Paper	Number of Questions Listed as Difficult	Questions in Geometry	Percentage of the Difficult Questions in Geometry
2008	1	6	4	67
2008	2	7	4	57
2009	1	10	5	50
2010	1	7	4	57

Source: KNEC reports

It is observed that more than other areas in secondary school mathematics, questions in Geometry are poorly performed. This study tried to assess mathematics' teachers' willingness to embrace technology, specifically GeoGebra in teaching Geometry in secondary schools in Kenya.

Objectives

This paper sought:
1. To find out mathematics teachers' training and competences towards use of technology
2. To establish Mathematics teachers' perceptions towards the usefulness of GeoGebra in Kenyan Secondary school mathematics.

Methodology

The research was conducted in secondary schools in Kajiado County Kenya. This paper was aimed at establishing the uptake of technology among the Secondary school Mathematics teachers in the county. Therefore, the target population was the Secondary school mathematics teachers who were seen to be 149 at the time this data was collected. Out of these, 22% was selected using simple random sampling. These teachers were trained on the use of GeoGebra for teaching Geometry. The teachers were then required to fill in a questionnaire on their experiences during training and their expectations in using the software. The findings were then analyzed and reported in form of a descriptive survey.

Findings

Teachers' Population as per their Gender

Kajiado county had 149 mathematics teachers by 2nd term 2014, this number is however not static since there is high mobility of teachers from one school to another and also by exiting from the service. The researcher sampled 33 of these mathematics teachers, both male and female. This is 22% of the total mathematics teachers in the county. Table 1.2 shows the population of male and female mathematics teachers in the county.

Table 1.2: Population of Mathematics Teachers in Kajiado County

	Frequency	Percent
Male	107	71.8
Female	42	28.2
Total	149	100.0

SOURCE: TSC office Kajiado County.

Table 1.3: Sex of the Sampled Teachers

	Frequency	Percentage
Male	23	21.5 of male
Female	10	23.8 of female
Total	33	

As Table 1.3 shows, the teachers' sample was comprised of 23 male and 10 female teachers. These figures represent 21.5% of all the male teachers and 23.8% of the female mathematics teachers. This shows that there was a fair distribution in terms of percentage of the total male and total female teachers. The sampled teachers were proportionately picked through simple random sampling. Out of a total of 149 mathematics teachers in the county, only 28% comprised of female teachers while the higher percentage of mathematics teachers were male. This finding is important because it reinforces the notion that mathematics is a difficult subject that girls are not particularly good at, hence the lower number of female teachers. This seems to be in agreement with the report of AAUW (2008) on "Where the girls are:" the report shows that there are few women in STEM; Science, Technology Engineering and Mathematics. The notion that mathematics and STEM is not for girls needs to be dispelled by demonstrating to students that both boys and girls can excel in the subject and

GeoGebra is a tool that can be used by both boys and girls to learn mathematics on a common platform.

Type of School Teachers Sampled

The study incorporated teachers from three types of schools, namely: boys' schools, girls' schools and mixed schools. Table 1.4 shows how the teachers' sample was distributed in the three types of schools

Table 1.4 Teachers' Distribution in the Three Schools

	Frequency	Percent
Boys School	9	20.0
Girls School	9	20.0
Mixed School	15	60.0
Total	33	100.0

A look at Table 1.4 reveals that nine teachers were drawn from boys' schools, nine from girls' schools and 15 from mixed schools. Roughly one half of these teachers were teaching boys and the other half were teaching girls. This was important for the study because the researcher needed the perspectives of teachers teaching both male and female students.

Sampled Teachers' Teaching Experience

The researcher included teachers who had taught for varied periods of time in the sample. Figure 1.1 shows the duration for which the teachers had been teaching mathematics by the time the study was conducted.

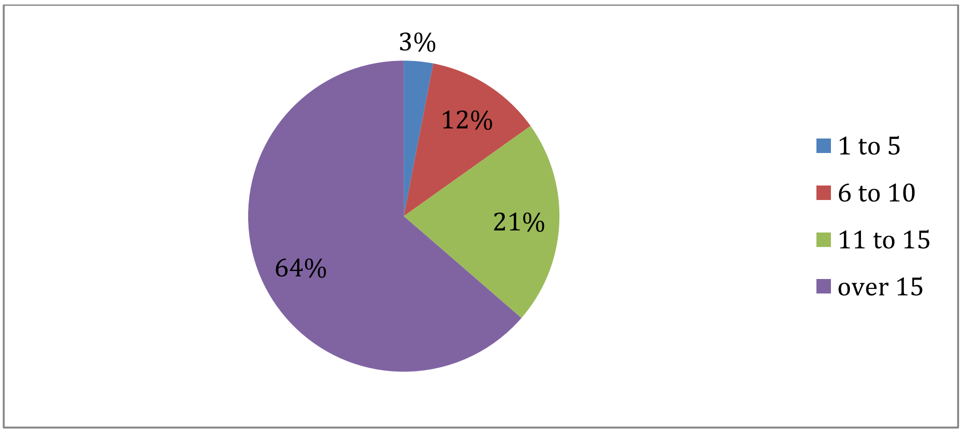


Figure 1.1 Duration Respondents had been Teaching Mathematics

An examination of Figure 1.1 reveals that 21 of the teachers, accounting for 64% of the sampled teachers had been teaching mathematics for more than 15 years. Only four of the teachers had taught for less than ten years. The study benefited from the fact that the teachers sampled had many years teaching experience. They not only had teaching skills developed over many years, they also understood the challenges of teaching mathematics in secondary school and could identify the most difficult and poorly performed topics.

Teachers' Level of Professional and Pre-service Training

The teachers were requested to state the highest level of professional training they had undergone. Their responses are summarized in Table 1.5.

Table 1.5 Teachers' Level of Training

	Frequency	Percent
Masters Degree	7	21.0
Bachelors Degree	25	76.0
Diploma	1	3.0
Total	33	100.0

Table 1.5 reveals that 25 teachers had bachelor's degrees while five had masters' degrees in various fields. Only one teacher had a diploma. Therefore, the teachers who participated in this study could be said to be sufficiently qualified to teach mathematics by virtue of their levels of training. In addition, all the teachers except on had computer related training and qualification. Figure 1.2 shows the computer related skills the teachers have mastered

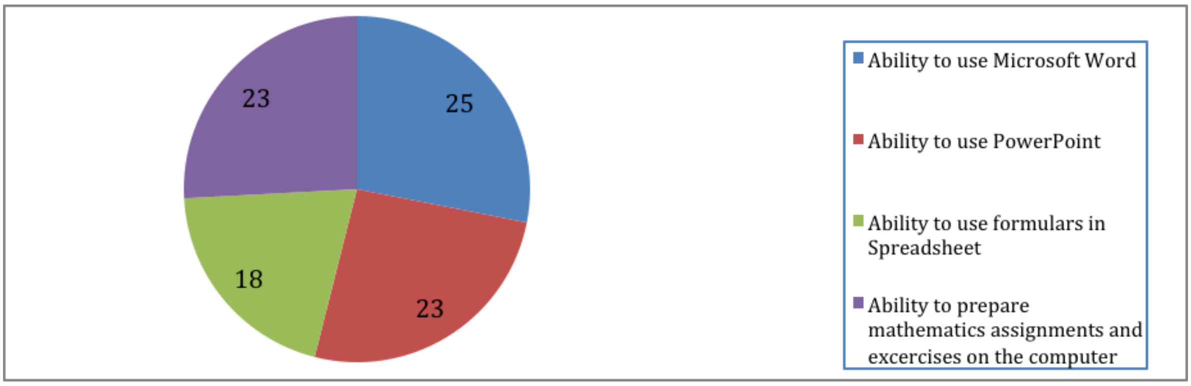


Figure 1.2 Teachers' Computer Skills

Figure 1.2 reveals teachers computer skills. All the teachers capable of using Microsoft word and all but two are capable of using PowerPoint and preparing assignments and exercises on computers. Eighteen teachers were able to use formulas in spreadsheets. This information leads to the conclusion that most of the teachers are skilled in using computers therefore they would have no problems using teaching software such as GeoGebra.

Areas of Mathematics Teachers Found Difficult to Teach

The teachers participating in this study were asked to state the areas of mathematics they found difficult to teach and note the reasons behind difficulty teaching those areas. Their responses are presented in Figure 1.3.

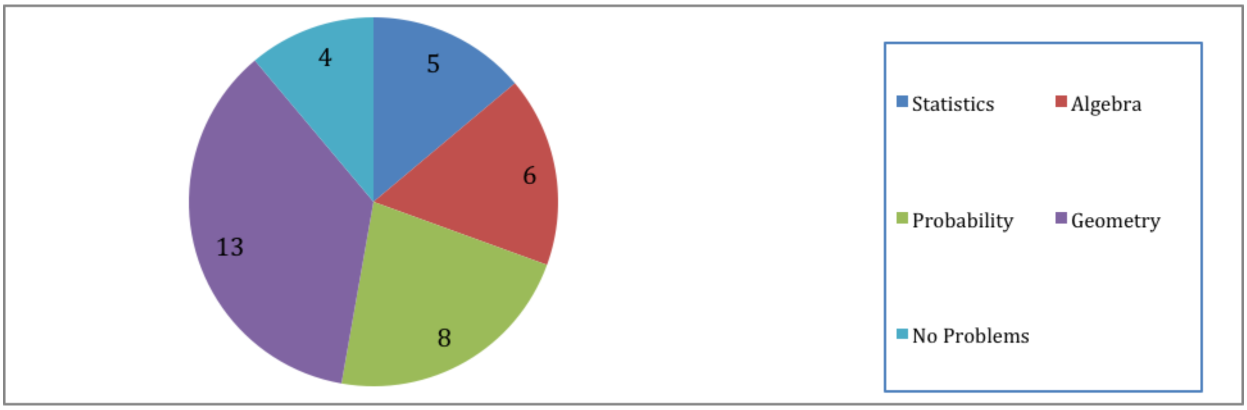


Figure 1.3 Teachers having Difficulties Teaching Mathematics

The responses summarized in Figure 1.3 show that only four teachers are facing no problems teaching mathematics. Geometry is the most challenging area to teach followed by algebra. It is noteworthy that more than half the teachers face difficulty teaching geometry and six of them face difficulties teaching algebra –the two topics GeoGebra is designed to help teach. The teachers having trouble teaching geometry cited lack of resources for teaching, the abstract nature of geometry and students' inability to visualize 3-dimensional images as the main impediments. For algebra, they cited students' difficulties comprehending complicated expressions and the abstract nature of the topic.

Teachers' Perceptions of their Competence in using GeoGebra after Training

The researcher sought to find out teachers' perception of their competence with GeoGebra after they received training on how to use it to teach mathematics. The teachers were presented with five items to gauge their competence by responding on each item on a scale ranging from strongly disagree, agree, not sure, agree and strongly disagree. Figure 1.4 presents a summary of the teachers' perception of GeoGebra.

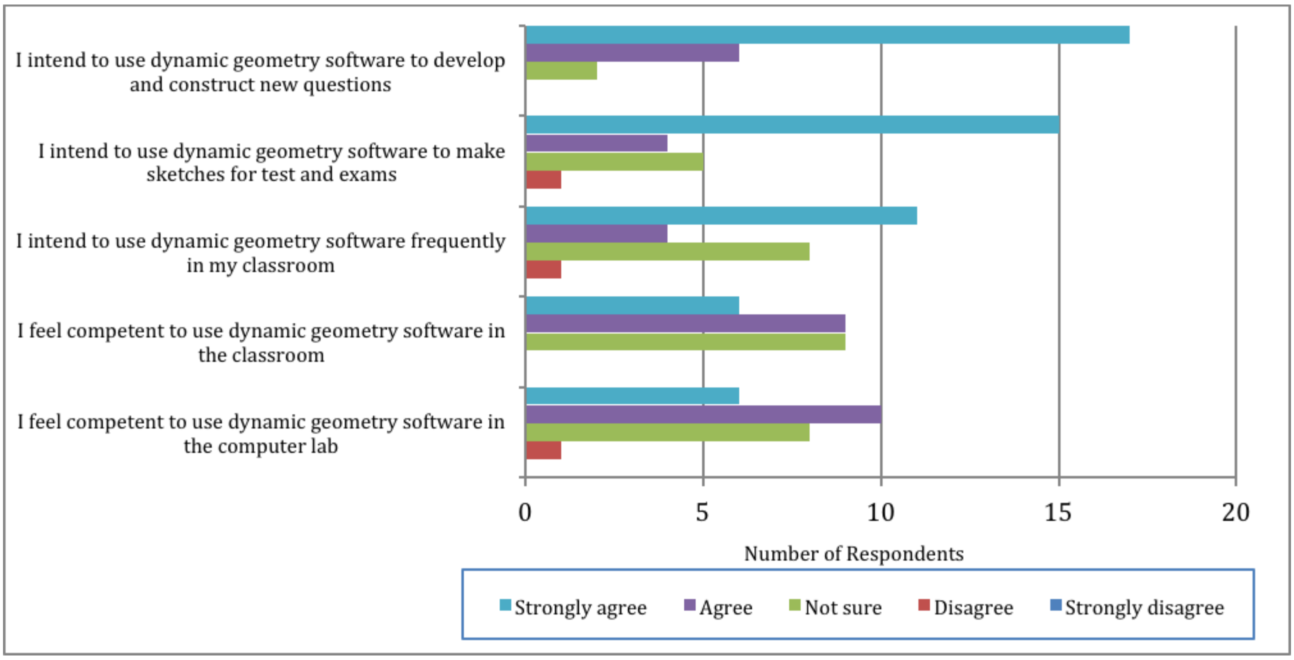


Figure 1.4 Teachers' Perceptions of their Competence with Dynamic Geometry Software

The information summarized in Figure 1.4 reveals teachers perception of their competence with GeoGebra after they received training on how to use it. It is possible to discern teachers' intentions for using the software and how competent they feel about using the software. To start with, 23 teachers intend to use the software to develop and construct new questions while two teachers are not sure, 19 teachers intend to use the software to make sketches for tests and exams with five teachers not sure and one disagreeing and 15 teachers intend to use the software frequently in class with eight not sure and one disagreeing. These findings lead to the conclusion that teachers who have been trained on using GeoGebra have noted its usefulness and are most of them are willing to adopt it.

Teachers' Perceptions of GeoGebras' Usefulness

After training the teachers on using GeoGebra to teach mathematics, the researcher sought to find out whether the teachers considered it useful. The teachers were asked to rate five items in the questionnaires by stating whether they strongly disagreed, disagreed, were not sure, agreed or strongly agreed with each item. Their responses are summarized in Figure 1.5.

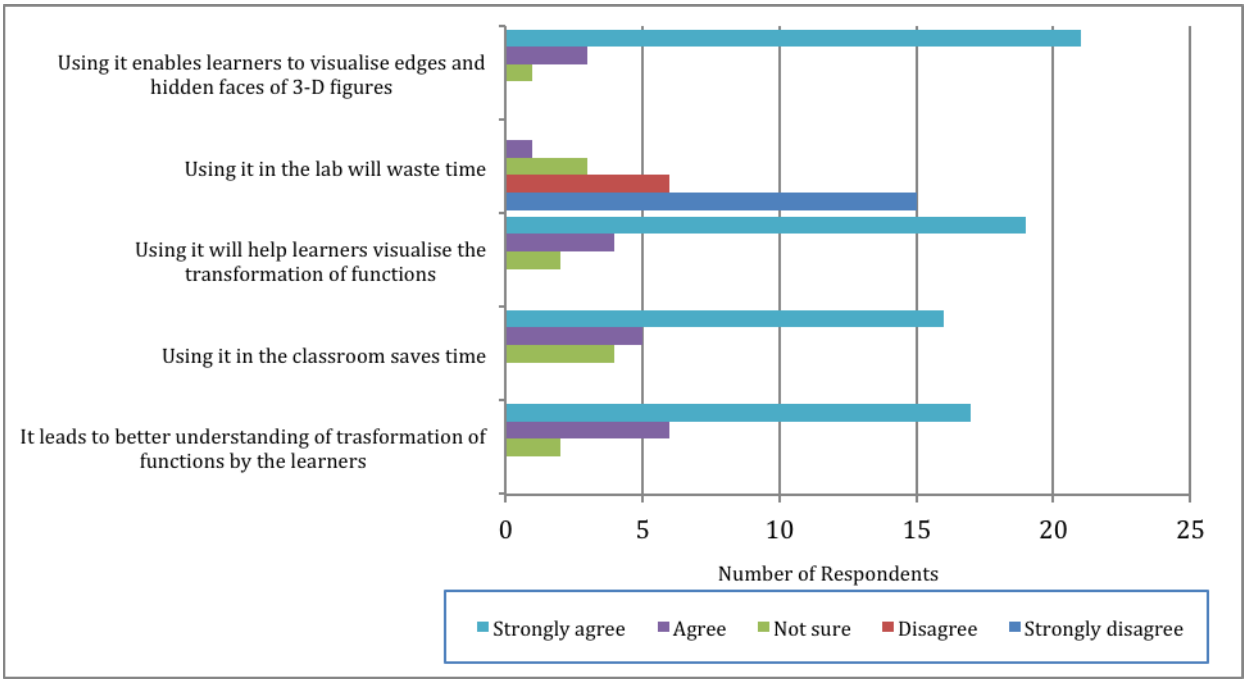


Figure 1.5 Teachers' Perceptions of GeoGebra's Usefulness

The information presented in Figure 1.5 reveals how teachers rated GeoGebra's usefulness in tackling various aspects of geometry. Only one teacher was unsure whether the software would enable learners visualize edges and hidden faces of three dimensional figures, two teachers were unsure whether it would help learners visualize transformation of functions and two teachers were unsure that the software would help learners understand the transformation of functions. All the other teachers believed the software was useful in achieving these goals. This finding shows that the GeoGebra software has the potential to improve the learners' ability to grasp concepts in geometry that they have difficulty understanding.

The information in Figure 1.5 also reveals that teachers find the software to be efficient in that it does not consume too much time. Twenty three teachers out of the 33 teachers (69.7%) felt that it would save time when used in the classroom and only one teacher felt using it in the lab would waste time. This quality of GeoGebra is important because it will enable teachers save time hence cover the syllabus more efficiently.

How Teachers Felt about Using GeoGebra in their Schools

The researcher sought to find out whether the teachers thought GeoGebra could be successfully used in their respective schools, how the software would help in their school and whether any factors in their schools could aid or hinder the use of the software. All the teachers who were sampled for this study stated that GeoGebra would be useful in their school and classrooms. Table 1.6 presents the reasons why teachers felt GeoGebra would be useful in their schools

Table 1.6 Why GeoGebra would be Useful in Schools

	Frequency	Percent of teachers
Improve understanding of abstract concepts	20	64.5
Introduce ICT to schools	6	19.3
Make mathematics interesting	20	64.5
Change students' attitude and increase participation	18	58.1
Improve students' manipulative skills	10	32
Assist in revision and making use of learning aids	4	12.9
Save time hence syllabus completion	4	12.9

As Table 1.6 shows, more than half of the teachers felt that GeoGebra could enable students comprehend difficult and abstract concepts in geometry. The teachers were also of the view that using the software would help introduce ICT to school, make mathematics more interesting and change students' attitudes to mathematics.

The teachers were asked to note factors that could aid or hinder adoption of the dynamic geometry software in their schools. Their responses are summarized in Table 1.7.

Table 1.7 Factors that could Aid or Hinder Adoption of GeoGebra

	Factors	**Frequency**	**Percent**
Factors that will aid	Availability of equipment like computers	15	48.4
	Availability of computer literate teachers	8	25
	Support from school management	25	83.9
	Positive attitude to ICT by teachers and students	5	16
	Computer literate students	2	6.4
Factors that will hinder	Insufficient resources like computers	16	51.6
	Lack of electricity	4	12.9
	Large number of students	20	64.5
	Teachers lacking ICT training	10	32
	Teachers reluctance to adopt ICT	1	3.2
	Computer illiterate students	1	3.2

As shown in Table 1.7, about on half of the teachers stated that availability of computers and other equipment would enable them use the software. The other half noted that absence of equipment as an impediment to implementing the software. Availability of computer literate teachers and a positive attitude towards ICT were also among the factors that teachers said would help them introduce the software to their schools. Absence of electricity and the large ratio of students to available computers were among the obstacles to using the software in some schools.

There was a 64.5% response that a large number of students would hinder the use of the software in teaching mathematics at secondary school level. A large number of teachers 83.9% felt that support from school administration would be necessary to facilitate use of GeoGebra in Kenya.

Summary of Findings

It would be concluded that Geometry and Algebra are areas in mathematics that teachers find complicated and hard to teach. By introducing GeoGebra, the teachers believed that teaching and understanding would be enhanced. Some teachers were excited and got to explore its usefulness and to prepare material that would be used in teaching Geometry. The adoption of this innovation is likely to improve the teaching of learning of Geometry and algebra but this can only be tested after complete adoption of this innovation. These findings lead to the conclusion that teachers who have been trained on using GeoGebra appreciated its usefulness and are most of them are willing to adopt it. Training exposed the teachers to GeoGebra and the feedback from the training sessions showed a positive perception towards GeoGebra. Further, research needs to be done to establish whether this excitement by teachers translated to better learning, understanding and hence better performance among the learners.

References

Abrahamson, D. & Wilensky, U. (2007). Learning axes and bridging tools in a technology-based design for statistics. *International Journal of Computers for Mathematical Learning*, *12*(1), 23-55.

Battista, M. T. (2007). The development of geometric and spatial thinking. *Second handbook of research on mathematics teaching and learning* Vol *2*, 843-908.

Battista, M. T. (2001). A research-based perspective on teaching school geometry. *Advances in Research on Teaching*, *8*, 145-185.

Battista, M. T. (1990). Spatial visualization and gender differences in high school geometry. *Journal for research in mathematics education*, 47-60.

Bu L. & Schoen R.(2011). *Pathways to Mathematical Understanding Using GeoGebra.* 3001 AW Rotterdam: Sense Publishers.

Chazan, D., & Yerushalmy, M. (1998). Charting a course for secondary geometry. *Designing learning environments for developing understanding of geometry and space*, 67-90.

Cobo, P., Fortuny, J. M., Puertas, E., & Richard, P. R. (2007). AgentGeom: a multiagent system for pedagogical support in geometric proof problems. *International Journal of Computers for Mathematical Learning*, *12*(1), 57-79.

Geometry and Mathematics. En.wikipedia.org/wiki/geometry**.**

Hill, C., Cobertt, C., & St. Rose, A. (2008**).** *Where the girls are: the facts about gender equity in Education.* Washington DC: AAUW.

Kenya Institute of Education, (2002). Teacher Education Pre-service course, K.I.E

Kenya National Examinations Council report on 2009 KCSE performance (c2010)

Kenya National Examinations Council report on 2008 KCSE performance (c2009)

Milrad, M., Spector, J. M., &Davidsen, P. I. (2003). Model facilitated learning. In S. Naidu (Ed.),*Learning and teaching with technology: Principles and practices* (pp. 13–27). London: Kogan Page.

Seel, N. M., Al-Diban, S., &Blumschein, P. (2000). Mental models & instructional planning. In J. M.Spector& T. M. Anderson (Eds.), *Integrated and holistic perspectives on learning, instruction and technology: Understanding complexity* (pp. 129–158). Dordrecht, The Netherlands: Kluwer.

Wilson, S. S. (2000). *U.S. Patent No. 6,023,530*. Washington, DC: U.S. Patent and Trademark Office.

PROBLEMATIC AREAS IN THE DIDACTICS OF TEACHING AND LEARNING FRENCH AS A FOREIGN LANGAUGE IN KENYA

Harrison Mulwa
Kenyatta University
hmmulwa@yahoo.co.uk

Agnes Gathumbi
Kenyatta University
agnesgath@gmail.com

Henry Ayot
Kenyatta University
hoayotk@yahoo.com

Performance in French as a foreign language (FFL) in secondary schools in Kenya had declined since the year 2006. Student teachers entering university to pursue studies in French are finding it more and more challenging to follow lectures delivered in French. Students' performance in the national Kenya Certificate of Secondary Education (KCSE) examinations seemed to have been affected when the examination format was changed to include testing of communicative competence, in all skills. To rescue this situation, the need arose for the teachers of French to use pedagogical approaches that would enhance communicative competence in FFL teaching and learning. The Communicative Language Teaching (CLT) approach had been adopted as a method for use in the teaching of FFL in Kenya. It was observed from students' performance that there has been a decline in performance in French since this change. This implies there are problems in the implementation and/or application of this approach. This paper is based on a study conducted to investigate the pedagogical implications of use of the CLT in teaching of French in secondary schools in Kenya. The objectives of the study were to: (a) establish activities that facilitate the application of the CLT, (b) establish teachers' preparedness in using the CLT, (c) find out other methods being used to teach French, (d) identify the challenges faced by teachers and students of French and how these were mitigated, (e) establish availability and use of resources for teaching and learning of FFL. The descriptive survey design was used for the study. Ten schools in 5 Counties of the Central region of Kenya were sampled for the study. Other samples were 10 principals of secondary schools teaching French and 109 students of French. The instruments for data collection were: a classroom observation guide, a teacher's questionnaire, a principal's interview schedule and a students' focus group discussion guide. A pilot study was conducted prior to the main study. Data were collected and analysed qualitatively using basic statistics. Inferential data were analysed using the chi-square. The findings of the study showed there was a marked degree of omission in the teaching and learning of French. The number of contact hours was found to be inadequate since French is a foreign language. Lack of modern equipment and shortage of other resources had negative effects, in relation to use of the CLT. The study also showed there was a difference between teachers' knowledge of theory and practice, with regard to CLT. Conclusions and Recommendations were made to make teaching and learning of French effective in the attainment of communicative competence.

Keywords: Communicative, Competence, Implementation, Teachers

Introduction

French is a national language in 28 countries around the world, (Belchamber, 2010). French represents the second most commonly taught foreign language across the world. It is, along with English, the most widely used global language. French is an official language of the United Nations, the African Union and is an official working language of many international organisations such as the International Red Cross and the International Olympic Committee.

More than 50% of African countries, former colonies of France but now independent, have adopted French as the official language as well as the language of instruction, at least at secondary and tertiary levels of education (Belchamber 2010). Kenya as a member of the

African Union needs to be able to communicate effectively with all members on all issues socio-economic, cultural and political. Consequently, the teaching of French as a foreign language finds its place within the educational curriculum, in Kenya.

History of French Teaching in Kenya

Teaching of French in Kenyan secondary schools began in an organised and official manner after independence, in 1963. This was brought about by the need to plan for socio-economic and cultural interactions with the rest of francophone Africa, hitherto closed to any form of exchange (Chokah, 2012). The Ominde commission was the first of several commissions mandated by the Kenyan government to review the pre-existing education system with a view to making education relevant to the needs of a new emerging politically independent society (Ominde Commission, 1964). It is within that context that French was introduced as a special subject in the secondary school cycle.

The first teaching method, ‘Voix et Images de France’, a first generation Audio-Visual method was welcomed with awe at the way learners were able to pronounce French just like the native speakers. This method through which mimicking of voices was the new discovery, led methodologists to acclaim it as some kind of panacea to hitherto experienced difficulties in foreign language learning, even though, despite good acquisition of prosody, learners could not produce independently of the laid out structures in the initial dialogue, in the *‘leçons’* (Rivers, 1982). In Kenya the reaction was no different from that of many other parts of the world. This method persisted as *the* method for some time. Meanwhile learners were at pains to acquire capacity for strategic competences in communication in FFL. As the rest of the world moved to more communicative competence based methods, so did Kenya. In 1992, the ‘Approche Communicative’, a French version of the CLT was adopted as the method for teaching of French as a foreign language in Kenya. There has not been a clear indication that teachers were fully in-serviced on the use of CLT and the challenges that the teachers experienced with this method did not facilitate better results for Kenya Certificate of Secondary Education examination. A study conducted in the five counties of former Central Province indicated that there was a corresponding drop in performance in French when, in 2006, the Oral examination, incorporating aspects of the CLT was introduced, as the table below shows.

Table.1.1: National Performance in French (2007-2011)

Year	**2007**	**2008**	**2009**	**2010**	**2011**
Mean score	6.2	5.7	5.4	4.9	4.7

Training of Teachers

The French language teacher in Kenya is usually faced with several challenges that may not be common to other subject teachers. Some of these include the question of plurilinguism among the learners. It can also be the relationship between the acquisition of and/or learning of English, and French as a foreign language (Chokah, 2012). The choice of method, as the study revealed, can also have consequences on the learning outcomes.

In Kenya, teachers of French are trained under the Bachelor of Education (B.Ed.) programme in several public universities and in one Diploma College for the diploma certificate. By the time they finish the training course, they will have completed between 300-350 hours of French studies. This is probably not enough given that the French teachers no longer get a one year scholarship to France, for immersion programmes, as it was the case earlier.

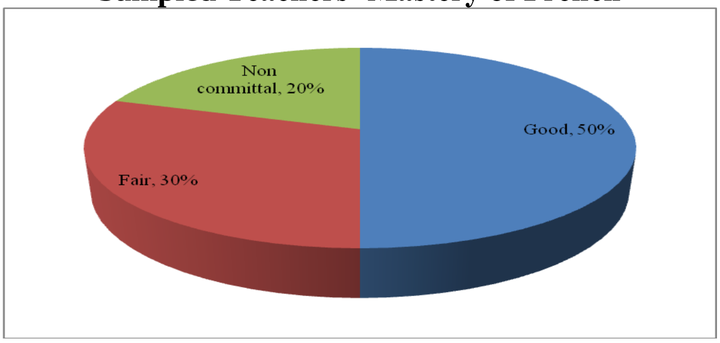
According to the Kenya Institute for Curriculum Development (KICD), formerly KIE, the objectives for teaching French at secondary level are: (a) To equip learners with the communicative skills for effective communication where French is required, (b) to give learners access to oral and written materials in French, (c) to facilitate further studies in Francophone institutions, and (d) to promote global peace through the understanding and appreciation of the cultures of French-speaking peoples and through a more positive perception of foreign peoples and their cultures. These objectives clearly point to the achievement of an underlying objective; that of enabling the learner of FFL to have the communicative competence to attain them, hence the introduction of the CLT, for that purpose.

Such objectives could be fulfilled only if the teachers themselves had the communicative competence to get their learners to that desired end. Earlier studies had shown that students enrolling into the university B.Ed. French course, to train as future teachers of the subject, were finding it increasingly difficult to follow lectures delivered in the target language, (Chokah, 2005)

Indeed one of the major criticisms levelled at CLT has been its demand for overall advanced linguistic ability in French to the extent that teachers who find themselves limited even in the socio- cultural aspect of their linguistic capacity would have challenges in their lesson delivery ability (Modard, 1990).

When teachers were asked to comment on their perceive competence in French, a large percentage were not sure they were competent enough, as the figure below indicates.

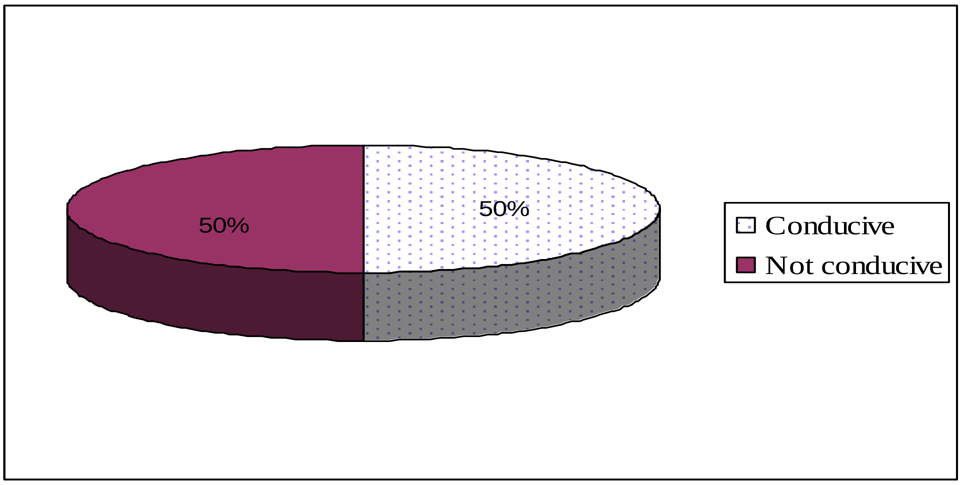
Sampled Teachers' Mastery of French



Only half of the teachers were sure of their capacity to communicate effectively in French. Conclusions were made that a teacher who is aware of their weakness on an issue such as communication naturally transfers this psychological state to their learners with a resulting failure to effectively facilitate the learners' objectives, desires, and needs.

The study also established that teachers rarely get in-serviced on new trends in the teaching and learning of FFL. Whenever that happens it does not involve all the teachers, especially because the numbers have increased more than thirtyfold since independence. Efforts have been made to decentralise in-service centres from Nairobi, but this has not resolved the problem due to many other issues, some of a logistical nature. This leaves teachers in a precarious position, as they continue to operate in an environment that is hardly conducive to their professional needs as the study found out in the figure below:

Teachers' Views on School Atmosphere and Conduciveness for Use of Communicative Approach



It seems then that the problem of communicative competence for the teachers emanated from lack of adherence to the prescriptive aspects of the adopted CLT as a method for teaching FFL at its inception at the secondary school level.

The study sought to know whether the CLT was implemented effectively, at the beginning, and what needed to be done in order for the teachers to acquire the required competence in order to be more effective in their delivery processes.

Moreover when teachers were asked to express their opinion on the quality of training they had received on FFL teaching, only 40% were able to say with certainty that they had received adequate training. The table below shows the teachers' responses.

Teachers' Views on their Training to Teach French

Opinion	**f**	**%**
Well trained	4	40.0%
Not well trained	6	60.0%
Total	10	100%

This table clearly indicates that the training that 60% the respondents had received was lacking in certain ways and that needed to be addressed.

Preparing Learners for Communicative Competence in Examinations

National Examinations are controlled and managed by the Kenya National Examinations Council. The Examinations have been constantly revised to reflect the changes in curriculum. With French, the realisation to effect changes only came belatedly, in 2006, ten years after the adoption of the CLT as the teaching approach for FFL. These changes introduced a revised Oral Paper in which candidates had to handle various tasks in the examination, both in the exposé and dialogue sections. (The other areas remained largely grammar-based, and not necessarily reality based). Performance in these areas tended to show lower scores than anticipated, and indeed had an overall effect of lowering the national mean.

A low ability in general exposure to regular task-based learning, in foreign language, as opposed to use of more traditionally grammar-based methods, would probably yield lower communicative competence among learners. This is the reason there has been a shift towards more task-resolution based methods in recent years. The Focus Group Discussion members were asked to give their level of competence in all the skills of Listening, Speaking, Reading and Writing. Their replies in the table below show their responses.

FGD Competence in Listening, Speaking, Reading and Writing in French

Skill	Very good		Good		Average		Poor	
	f	%	f	%	f	%	f	%
Listening	1	5.6	5	27.7	12	66.7	-	-
Speaking	1	5.6	1	5.6	11	61.1	5	27.7
Reading	1	5.6	6	33.3	11	61.1	-	-
Writing	1	5.6	3	16.7	11	61.1	3	16.7

Learners had poor ability in speech in French. Only 11% of the learners were good in communication, while 30% were unable to communicate in French at all. Any facilitator not aware of the need to apply these new task–based approaches would be denying learners opportunities to acquire speech ability in class, faster. As indicated earlier, every method comes with a certain degree of prescription. The CLT has certain basic activities which well applied in the classroom would help learners to achieve more communicative competence. The study required Focus Group Discussion (18 in number) members to indicate which activities their teachers engaged them in, in order to help them attain ability in communication. Their responses were indicated as shown below.

Activities Used by Teachers to Encourage Speech Among Learners

Activities	**f**	**%**
Role play	3	16.7
Classroom grammar exercices	11	61.1
Listening to the radio	6	33.3
Question and answers	16	88.8
Reading passages	9	50.0

Looking at the table above, it is clear that the role play did not seem a priority during learning, yet it is a guiding force in the completion of a speech act.

Research Questions

The research questions were:

1. Which factors facilitated the use of CLT in the teaching of FFL?
2. How prepared were teachers, to use the Communicative Approach in teaching FFL?
3. What other methods were teachers using to teach FFL?
4. What challenges did teachers and students face while teaching and learning FFL and how did they handle the challenges?
5. What FFL teaching and learning resources were available in schools?

Pilot Study

The main reason for the pilot study was to find out whether indeed the instruments were measuring what they were supposed to measure, (Kombo and Tromp, 2009). The researcher selected and visited three secondary schools, in central Kenya and arranged for pilot testing of the instruments namely; the questionnaire, observation of teaching and learning session, interview with Principals, and focus group discussion, in a Form three French lesson. The three selected schools did not take part of the main study. The researcher observed a teaching session as he filled the observation schedule. This enabled him to see if there was need to include any additional information, necessary for the completion of the schedule. Item ‘j’ was found to have a certain degree of redundancy and was therefore readjusted and incorporated into items ‘e’ and ‘f’, for more clarity of observation. The researcher then administered the questionnaire on the teachers. After that, the researcher organized for the focused group discussion (FGD). This was done through random selection of six students from the class list, while ensuring gender parity. These discussions were recorded on magnetic tapes. Finally the researcher conducted the interview with the Principal of the school. The information was then analysed with the aim of establishing whether there was a need to modify it on the research instruments. As there was none, apart from the changes in the observation schedule, the instruments were ready for application in the actual research.

Data Collection

A research permit was sought from the Ministry of Education after a presentation of an introductory letter from Kenyatta University. On obtention of the permit, the researcher, together with his assistant visited the selected schools in which the research was to be carried out to introduce himself to the schools administration, including teachers. Relevant times agreeable to all parties were established, including length of a lesson (one hour for the FGD session). The procedure was carried out in an orderly fashion such that the teacher would begin by filling in the questionnaire, while the researcher and his assistant simultaneously carried out the FGD session. Each FGD group had six students (Krueger, 2002). Rooms were availed for installation of recording device. The researcher introduced himself and made members ready. As discussions continued notes were made according to members' contribution to each question.

Data Analysis

The data from teacher questionnaires was of both qualitative and quantitative nature. Answers to each of the open- ended questionnaires were read and categorized on theme basis. This information was coded. It was then entered into the computer for analysis, using the software known as the Statistical Package for Social Science (SPSS). The data was now ready for presentation and interpretation, using the descriptive analysis. Closed-ended questionnaires, already pre-coded, were entered into the computer and the information was treated, using the SPSS program, to generate statistics for descriptive analyses.

The data from the class observation schedule was mainly of qualitative nature, with a small amount being quantitative, in its raw state. Qualitative data was studied, interpreted for establishment of themes. Next, it was coded, and entered into the computer using the SPSS software. Quantitative data was entered in the computer and analyzed, again using the Statistical Package for Social Science. The data was then ready for interpretation and reporting.

Qualitative data from open-ended questions was transcribed from audiotapes of magnetic nature, and arranged according to themes emerging from each question. The information was coded and entered into the computer for analysis using the SPSS programme. The quantitative data already pre-coded, was entered into the computer and analyzed using the SPSS software, ready for reporting.

The data collected from interviews with School Principals was read and categorized into themes. It was then coded and entered into the computer, to generate descriptive analysis, using the Statistical Package for Social Science, (SPSS).

Outcome of the Study

Even though respondents were conversant with the CLT, they felt that their mastery of French was not at the expected level, throwing into doubt their communicative competence. Most respondents did not have a conceptual understanding of the CLT. Schools environments were not conducive to learning French using the CLT. Learners were not keen to learn…perhaps due to improper application of learning methods or other extraneous factors such as need for speedy coverage of syllabus. Only a few respondents were confident of their ability to cope with the rigors of the CLT, particularly in relation to idiolect. Key markers of CLT such as speech acts, negotiation of meaning et cetera, were used only sparingly and sociocultural references were absent in the lessons Teachers seemed to spend too much time talking, not availing enough time to learners to acquire competence in communication, and the concept of translation, in the CLT was misappropriated. Teachers seemed to revert back to methods such as Audio-visual, from which the CLT evolved, which were relatively less effective in the teaching of communicative competence. Some of the teachers were not able to establish what methods they were using whilst handling certain aspects of their lesson progression. Time was a major challenge. Teachers felt that lessons per week were too few to cover syllabus satisfactorily.

There was generalized paucity in teaching resources and existing textbooks. Textbooks such as “Parlons Français” were lagging behind in terms of content, presentation and relevance particularly with regard to the CLT requirements.

Conclusion

The following section gives some suggestions for further research on areas related to this study. The study focused on implementation of the CLT across the independent variables of the FFL syllabus, time allocation, the resources available and teacher qualification; and implications of that implementation on FFL pedagogy in secondary schools. Although the study revealed gaps in the application of CLT, there was a need for additional research to throw more light on the findings.

This study revealed that teachers felt they understood the nature of the CLT in a theoretical sense, yet their application of the same showed many lapses across the board. Better understanding of causes of these lapses calls for further inquiry into the way in which the CLT was introduced to teachers, with in-depth into matters relating to details such as lesson entry behavior, and how to handle the components of the CLT within the context of practical application of this approach.

The need to study extraneous factors that may possibly contribute to failure for teachers to be aggressive and resourceful towards the fulfillment of learners needs in the attempt to acquire communicative competence in FFL learning could also be looked into. Such issues may involve, for example, levels of motivation for the teachers in relation to workload, exposure to immersion programmes et cetera. Further research into this would probably bring out areas KICD, MOE and training institutions, all involved in FFL pedagogy, need to remedy in order that learners and teachers alike could benefit from the approach they are using, in teaching and learning.

The Kenya Certificate of Secondary Education Examination of French needs to be reexamined with emphasis on study of whether it is fully communicative competence based, for the Kenyan learner as per the modes of assessment under the CLT. This does not mean review of the oral examination only. Evaluation of the effectiveness of the CLT needs to be effected across all the skills of language teaching and learning.

References

Besse H. (1985) Méthodes et Pratiques des Manuels de Langue, Paris, Didier/Crédif, Coll. Essais p. 165. Aguilar, I. (2011) What is CLT. Retrieved from
internelink;www.slidesshare.net/ivanslides/what...

Bérard, E. (1991): L’Approche Communicative: Théories et Pratiques, Paris, Clé International, collection Didactiques des Langues Etrangères.

Belchamber, R. (2010). The Advantages of Communicative Language Teaching, Melbourne, Australia, pp54-75.

Belchamber, R. (2010). The Advantages of Communicative Language Teaching. The Internet TESL Journal Archives. Available on www.iteslj.org/Articles/Belchamber-CLT.htmlBlumfit, A. (1991). Junior Secondary English for Botswana and Recommendations for
Improvement, Ministry of Education, Gaborone, Botswana, pp6-7.

Chang, M in Littlewood(2007),

www.ccsenet.org/journal/index.php/clt/.../7603,2010)
Chang, M. (2010). Factors affecting the implementation of Communicative
Language. In Littlewood Vol. 4,
www.ccsenet.org/jaurnal/index.php/clt/..../7603
Choka, M. M. (2005). Best practices in East Africa, East and central Africa conference on the teaching of French, K U Conference Centre
Choka, M. M (2012) l'Enseignement du Francais au Kenya, Jomo Kenyatta Foundation, pp, 123
Coady, J. And Huckin, T. (1997). Second Language Vocabulary Acquisition: A
Rationale for Pedagogy. Cambridge and Cambridge University press p
Creswell, J.W. (2012) Educational Research; Planning, Conducting and Evaluating
Quantitative and Qualitative Study. Pearson Education, Inc. Boston,
MA02116: p.376
Dick, B. (2002). Action and research, link, http://www.scu.edu.au/schools/gcm/ar/arp/aandr.html
Dramé, M. (2007). Language in Education, Liens Nouvelle Série, Number 10, Revue Internationale, Dakar, CRDEP/ENS/UCAD, Senegal
Dramé, M. (2004). Communicative Grammar Teaching in a Foreign Language context, Liens, Nouvelle Série, Number 7, Revue Internationale, Dakar, CRDEP/ENS/UCAD, Senegal
Dramé, M. (2004). Resistance to communicative Language Teaching in a Foreign
Language Context: A Senegalese Case Study. Universite Cheikh Anta Diop, Dakar, Senegal.
Fraenkel, J.R; Wallen, N. E. (1993). How to Design and Evaluate Research in Education.
McGraw-Hill (New York)
Gay, L. R. & Airasian, P. (2000). Educational Research: Competencies for Analysis and Application. Upper Saddle River: Merrill Publishing Company.
Germain C., (1993) Evolution de l'Enseignement des Langues: 5000 ans d'Histoire, Paris, Clé International, p.296.
Hadley, A. O. (2001). Teaching Language in Context, (3rd Ed.).Boston, MA: Heinle & Heinle Publishers.
Kangethe, F.I (2006) Research on French Teaching in Eastern Africa. USIU,
p 71, p52.
KNEC, (2011). Performance per subject, Kenya National Examination Council.
Kombo D. and Tromp L.A. (2009). Proposal and Thesis writing, Pauline Publications; Africa, Kenya.
Krueger (2002). Designing and Conducting Focus Group Interviews in link
www.eiu/-ihec/Kruger-Focus Group Interviews.Pdf, p 1-6.
Lafford, P. (2005). Computer Mediated Technologies for Teaching Foreign
Languages: What's on the Horizon? Vol. 22, No3, p162
Lane, R. Cognitive Development in English Language Teaching,
Lewis, J. (2000).Qualitative Research Practice: A Guide for Social Science
Students and Researchers,
Liao, Q. (2000). How communicative Language became Acceptable in Secondary
schools in China. Internet TESL journal .vol.vi, No 10, p25-30
Littlewood, W. (1981). Communicative LanguageTeaching. New York: Cambridge University Press.
Mago, R. K. (May, 1987). An effective communication approach for the introduction of French literature. The French Review Journal, Vol. 60 no. 6. Accessible through: http://www.jstor.org/stable/393769
Mamadou, D. (2011). Language in education. University Cheick Anto Diof Retrieved from http://fastef.ucad.sd/Lians10a12.pdf
McMilian, J. H. & Schumacher, S. (2001). Research in Education. A Conceptual Introduction, (5th Ed.). NY, Longman
Modard. P. (1990). Aspects of Methodology in the didactics of French as a foreign Language. Universite de Rouen.
Moirand, S. (1982). Enseigner `a Communiquer en Langue. Paris, Hachette p144.
Mugenda, O. M. and Mugenda, G. A., (2003). Research methods: Quantitative & Qualitative Approaches, Nairobi ACTS Press.
Muyskens. (1998). Characteristics of Audio-Lingual method.
Nunan, D.(1991).Communicative tasks and the language curriculum. TESOL quarterly, p279–295.
Nunan, D. Practicing English Language Teaching, New York, McGraw Hill.
Obura, (1982). Attitudes and Motivation, Language and Learning strategies and
achievement in French in Kenya: A correlation analysis and experiment, Ph. D. thesis; Kenyatta University.
Ogula, P. A. (1998). A Handbook on Educational Research. Nairobi: New Kemit Publishers.
Ominde, S.H. (1964). Kenya Education Commission Report. National Government publication
Orodho, J. A., (2005). Elements of Education and Social Science Research Methods. Nairobi, Kanezja Publishers.

Owino, P (2007) Directory of Teaching of French in Kenya. Alliance Francaise.
Vol 7.
Owino P, (2012) French in Kenya Journal, Vol. 7, p 4. KATF
Owino P, (2009) Ufaransa Leo Issue, Vol 6, p5. Alliance Francaise
Owuondo, E., (2011). Instructional Methods for Composition Writing in French at the Secondary School level in schools in Nairobi, Kenya. Masters Thesis pp 1-4, Kenyatta University.
Ozsevik, Z (2010) The use of Communicative Language Teaching (CLT): Turkish
EFL Teachers' perceived difficulties in implementing CLT in Turkey.
Masters Thesis, pp. 39-40.Pufahl, I. & Christian, D. (2001). Foreign Language Teaching: What the United States Can Learn from Other Countries. Foreign Language Annals, 34(3), p.281-83.
Reyner at al (2001) Methods of Teaching Reading, Pittsburg University, pp112.
Richards. J. (Ed) (2010). Communicative Language Teaching Today. Cambridge
University Press
Richards. J and Rodgers. T. 1986. Approaches and Methods in Language
Teaching: A Description and Analysis. Cambridge: Cambridge University
Press.
Rivers.W. (1982) Psychology and the Foreign Language Teacher, Longman p 296.
Savignon, S. (1983) Communicative Language Teaching: Linguistic Theory and Practice, Yale University Press, p 3-23.
Skehan, P. (1989). Individual Differences in second language learning. London, Edward Arnold Publishing Ltd.
Stern, H. (1992) Fundamental Concepts of Language Teaching, Oxford University Press.
Swain. M. (1980). Theoretical Bases of Communicative Approaches to Second Language Teaching and Testing, Oxford University press.
Wamalwa, W. N. (1972). The Wamalwa Report. Nairobi:Government printer, Kenya.

BASELINE SURVEY ON THE QUALITY AND EFFICIENCY OF TEACHING PRACTICE IN MIDDLE LEVEL COLLEGES: THE CASE OF KENYA TECHNICAL TEACHERS COLLEGE, NAIROBI, KENYA

Benedicto Mwancha
Kenyatta University

Samson Ondigi
Kenyatta University
ondigi@yahoo.com

David Khatete
Kenyatta University
dkhatete@yahoo.co.uk

This is a survey carried out in 2014. The main objective was to determine the important indicators against which the quality and efficiency of future Teaching Practice will be compared. There were 256 students on teaching practice. A sample of 141students was randomly selected representing 54% of the population. All the assessment reports for all the students were used to determine the student performance. A sample of 10 heads of institutions and 31 Heads of departments and cooperating teachers supplied some needed data. Data was also generated from 11 external assessors. Questionnaires were used for data collection except for the case of heads of institutions where an interview schedule was used. The relevant documents available in college were also used as data sources. All the instruments were tested and validated by using experts for both content and technical accuracy. Quantitative data analysis was done by using SPSS. The means were worked out and where there was need to establish significance of differences, the "t" and "F" tests were carried out. The indicators for quality and efficiency of teaching practice were as follows: Average number of assessments per student was 2.9; Average performance was 72.14%; Overall Cost per student was Ksh. 25,507; Mileage per student was 120.516Km; Fuel consumption per student was 16.121 liters; Fuel cost per student was 1797.98 Ksh; Completion rate was 97.7% and TP student satisfaction 87.37%. Other findings included: The use of teaching aids and scheming are performed poorly. The components of self-presentation and learning environment have the highest score. The females have a higher mean performance than the males; the students' grades are not dependent on the gender of the assessor. The higher the job groups of the assessors, the higher the mean score. The TP customers are highly satisfied with the services they receive. TP costs, placement, transport, frequent changes in timetables are some of the challenges facing the exercise. It is safely concluded that Kenya Technical Teachers College has maintained high standards in the management of teaching practice. The following recommendations are made: The approaches used in training students in scheming and lesson planning should be re-examined; the media should be better equipped in order to train students better in the development and use of teaching aids.

Background of Kenya Technical Teachers College

The Kenya Technical Teachers College (KTTC) has the mandate of training technical teachers as provided in the Education Act Cap 211 (revised 1980) and Legal notice No.242 of 1978 and repealed by the Technical, Vocational, Education and Training (TVET) act of 2013

The college currently trains teachers at Diploma level in their various options of technical training (Electrical Engineering, Mechanical Engineering, Building and Civil Engineering, Business Studies, Institutional Management and Information Studies).

Background of Teaching Practice

Teaching Practice in Kenya Technical Teachers College is defined as an opportunity provided to teacher trainees for a period of one school term in the Kenya school calendar to participate in the implementation of the curriculum during which the trainee is supervised, guided and simultaneously assessed and graded. The concept is broadly viewed as the bridge between the theoretical knowledge the teacher trainees have learnt during their stay in college, and the real life educational practice. Teaching Practice is an integral part of any sound teacher training program. It marks an induction of the teacher trainee into the teaching profession. This is as a prerequisite for certification as a teacher. The aim of Teaching Practice is to help the trainee to: (a) analyze problems in teaching, (b) plan adequately, (c) polish social-interaction skills, (d) handle problems in a normal institution environment, and (e) analyze the whole Teaching Practice process and continuously improve.

In Kenya Technical Teachers College, the trainees qualify when they have passed both the Teaching Practice and academic subjects. The assessors for the exercise are the lecturers who in this case are referred to as the internal assessors / internal supervisors and the officers appointed by the ministry through the quality control and assurance directorate (external assessors).

Rationale for Teaching Practice Appraisal Baseline Survey

The purpose of this study was to evolve indicators on which efficiency and quality of teaching practice will be measured in the future.

Objectives

The objectives that guided the study are as follows. To find out the performance indicators in terms of:

1. Average number of assessments per student,
2. Average performance of students,
3. Cost per student,
4. Mileage per student,
5. Teaching Practice Completion rate,
6. Teacher trainee satisfaction index,
7. To establish the challenges experienced in execution of teaching practice.

Methodology

This study used a cross sectional survey design. This study was set out to document the practices, as they exist. This is therefore basically a descriptive survey.

Population

The target population comprised of 256 students on teaching practice

Sampling

A census was carried out on the assessments generated from the 256 students. With respect to obtaining the extent of satisfaction with the teaching practice process, a sample of 141 (55%) students was constituted using simple random sampling technique.

Instruments

There were three instruments used: (1) Teaching practice observation form (2) Document analysis guide (finance and transport documents) and (3) Questionnaire for teaching practice students

Data Presentation and Analysis Procedure

The objectives were used as a basis for data presentation. This study yielded both qualitative and quantitative data. The qualitative data is presented in narrative form. Quantitative data generated was processed by using SPSS software. A combination of means and frequencies are used to build and support the findings. The significance of differences was established using ‘t’ and ‘F’ tests at 95% confidence limits. Appropriate combination of text and graphics are used in presentation.

Results

A summary of the indicators of performance in teaching practice is presented in table 1

Table 1: Summary of Indicators of Performance

Indicator	Unit of measurement	Index
Average number of assessments per student	Number	2.93
Average performance of students	%	72.14
Overall assessment cost per student	Ksh.	25,507
Mileage per student	Km	120.516
Fuel consumption per student	Lt	16.121
Fuel cost per student	Ksh	1797.98
Completion rate	%	97.35
TP customer satisfaction	%	88.08

The Number of Assessments per Student

The Kenya Technical Teachers College Teaching Practice guidelines provide that each student should be assessed at least 3 times by the internal assessors before the conclusion of teaching practice. The other requirement is that an assessor shall not assess a student more than once in any given series. The assessments done for the 256 students were 748 giving an average of 2.9 assessments per student

Performance of the Students

The overall performance of the students is determined as the average of the marks in all the assessments of all the students. This was found to be 72.14%.

The performance trend is such that it is increasing from the first assessment (70.03%) to (72.22%) in the second assessment and (74.18) in the third assessment. This is expected given the fact that the trainees are getting accustomed to the instructional environment and are therefore improving as a result of the guidance and supervision they are continuously receiving. There were significant differences in the mean performance between the first and second assessment, second and third assessment and first and third assessment at 95% confidence limit when using a ‘t’ test.

The performance on the components of the assessment form are presented in table 2

Table 2: Average Performance in the Instructional Components

Component	Av %
Self presentation	76.53
Learning environment	75.60
Mastery of the subject	75.17
Overall performance	74.13
Lesson development	73.79
Introduction	73.73
Summary	73.53
Lesson plan	72.03
Teaching methodology	71.80
Log book	71.77
Schemes of work	68.80
Teaching aids	68.20

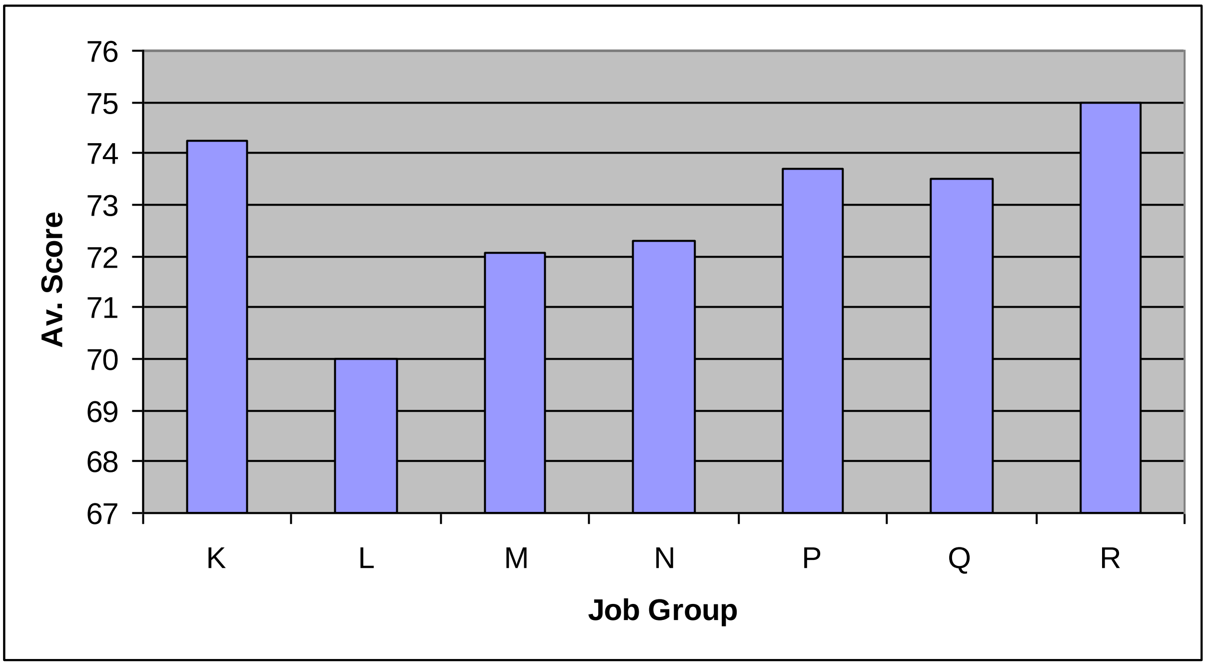
The top three areas of strengths are identified as self-presentation, learning environment and masterly of the subject. Three areas of weaknesses are identified as teaching aids, schemes of work and the logbook.

Performance based on gender. The data p indicates that female students have a better average at 72.83% and the male students mean is 71.71. However, there was no significant difference at 95% confidence limit when using the 'F' test through the three assessment levels.

Student mean scores based on gender of assessor. The internal assessors comprise of both female and male. The average assessment scores for female assessors is 72.30% and male assessors is 72.11%. The means are not significantly different for the three levels of assessment using an 'F' test at 95% confidence limit.

Student scores based on the job group of the assessor. The college assessors range from job group K to R. The frequency of assessments is presented in figure 1. The average scores in the respective job groups are presented in figure 3.4

Fig 1: Average Scores Job Group wise



Teaching Practice Costs

The teaching practice costs are based on the items approved by the college management to ensure that the exercise is carried out efficiently and effectively without sacrificing the quality of the graduates. The considered items in the costing process are mainly: Basic materials for the students and assessors; Allowances for students; Allowances for the internal and external assessors; Allowances for the divers and the fuel costs.

The basic teaching practice materials refer to carbon papers, manila papers, schemes of work sheets, lesson plan sheets, assessment booklets and envelopes. The student allowance provided is Ksh 21900 per student for the three months on teaching practice. The lecturers allowance per day is based on job groups that are banded as: N, P&Q (5000); KL&M (4000). The drivers get a daily allowance of 2,500.The total expenditure for the teaching practice is Ksh. 9,182,354. The overall cost per student translates to Ksh. 25,507.

Mileage

The college has a fleet of vehicles dedicated to the teaching practice**.** The distances covered as per the records in the transport office indicated a total of 30852 Km and fuel consumption of 4126 liters.

Teaching Practice Trainees Satisfaction

The trainees were issued with an instrument containing rating type of items on key aspects of teaching practice. The items addressed issues on preparation and execution of teaching practice on a 5-point scale ranging from very poor to excellent. The data collected is presented in table 3

Table 3.Trainees' rating of satisfaction elements

Element	N	Mean	%	Std. Dev
Extent of usefulness of KTTC curriculum experiences in TP	91	4.49	89.8	.751
Level of training in scheming and lesson planning	135	4.33	86.6	.871
Level of training in preparation and use of teaching aids	140	4.17	83.4	.856
Adequacy of the procedure used for TP posting	138	4.04	80.8	1.024
Level of communication efficiency on TP matters	140	4.24	84.8	.847
Timing of the provision of basic TP materials	138	4.30	86	.977
Extent of usefulness of TP briefing sessions	139	4.30	86	.906
Assessment Interval	139	3.99	79.8	.989
Punctuality of assessors	138	4.46	89.2	.785
Assessors presence through the lesson	139	4.69	93.8	.550
Quality of post lesson discussion	139	4.56	91.2	.627
Interaction between the trainee and the assessor	140	4.63	92.6	.639
Accuracy of the assessor's comments	141	4.39	87.8	.800
Freedom from Gender bias in assessment	141	4.50	90	.789
Freedom from Ethnic bias in assessment	141	4.44	88.8	.897
Average			87.37	

The trainees' satisfaction stands at 87.37%. It is evident that the performance of supervisors is rated higher and therefore perceived to be favorable. The areas of challenge remain to be the scheduling process for assessment perceived to be clouded and too short for the trainees to internalize the advice given to them. The preparedness of trainees in developing and using teaching aids needs to be strengthened.

Teaching Practice Completion Rate

The records in the examination office indicate that there were a total of 256 students bound for the January 2014 teaching practice. A total of 3 students withdrew and a total of 3 students obtained a fail mark. Therefore 250 students successfully completed teaching practice giving a completion rate of 97.7%

Suggestions by Teaching Practice Students on Improvement of Teaching Practice

The suggestions made by the students are varied, some are objective and others need to be reexamined or dismissed altogether. The following are sampled suggestions:

1. Student allowance to be provided in good time
2. Assessors to inform students when they are to be assessed
3. Duration between one assessment and the next to be given at least one week
4. Teachers of education department to teach special methods

5. The assessors to be consistent on how schemes of work and lesson plans are to be done
6. Increase teaching practice allowance
7. Eliminate daily diary
8. The college to work registration of trainees with TSC before completion of TP
9. Provide proper orientation on selection of TP institutions
10. Teaching practice duration to be increased to 2 terms
11. Assessors to avoid asking for lessons to be arranged for assessment
12. Assessors should be those conversant with the content of the subject they assess
13. Reduce assessment to a minimum of 2
14. Allow students to borrow books as they go for TP
15. Show students the assessment score as part of post lesson discussion
16. External assessors should assess all students and not by sampling

Challenges in the Management of Teaching Practice

The salient challenges in the execution of teaching practice are highlighted in this section. The challenges include:

1. Cost – the college spent over Ksh.9 million as direct costs. This is an expensive exercise but necessary in the training of teachers
2. Placement – placement of students in institutions that are accessible is not easy. Some principals are becoming hesitant to accept KTTC students for the reason that they are diploma holders. This is a dilemma given that the college has not been upgraded to degree awarding status.
3. Changes in timetables – some institutions take time for their timetables to settle. This is characterized with numerous changes at times that are not communicated to the teaching practice coordinator. This subsequently results in students not assessed as projected by the coordination office
4. Transport – The college vehicles are not enough for students spread throughout the country. This has resulted in teachers using public means or personal cars. Use of public means especially motor bikes raises the issue of insurance should an accident occur. The use of personal cars has no policy guidelines at the college level which leads to dissatisfaction of teachers especially when the expenses incurred are not compensated by the college.

Conclusion

The Kenya Technical Teachers College has maintained high standards in the management of teaching practice despite the challenges faced. The high average performance and the high level of satisfaction are the key indicators that the college is producing high quality teachers for the institutions they are intended for.

Recommendations

The recommendations made hereunder are intended to help the college continually improve in the training high quality technical teachers:

1. The approaches used in training students in scheming and lesson planning should be reexamined. This entirely rests with education department particularly the unit of general methods
2. The teachers of special methods should be able to teach general methods. It may be incredible if that cannot happen. If that be the case then that is the beginning of starting to confuse the students in the process of preparing the professional documents up to implementation of instruction
3. The media should be better equipped in order to train students better in the development and use of teaching aids. The training and experience of lecturers in the

area of media should be considered so that only those who are more knowledgeable are allowed to teach educational technology.

4. The teaching practice department should set targets based on the worked out indicators and draw up a plan on how to meet them. This will facilitate continued improvement

MENTORING SECONDARY SCHOOL TEACHERS FOR EFFECTIVE TEACHING AND LEARNING

Leonard Mwangangi
Kenyatta University
dkhatete@yahoo.co.uk

Henry Ayot
Kenyatta University
hoayotk@yahoo.com

Mueni Kiio
Kenyatta University
dr_mueni@yahoo.com

Teachers perform a variety of duties such as implementing the syllabus content, dealing with classroom management, issue of learners' discipline, integrating students with special needs, using technology, co-curricular activity and being accountable to various stakeholders of education. These tasks can be difficult and stressful to smoothly enable teachers perform there is need for mentoring programs. Mentoring has been described as a nurturing process. In which a more skilled person serves as a role model by teaching sponsoring, encouraging, counseling and befriending a less skilled and less experience person i.e. protégé for the purpose of promoting professional development and efficiency, The overall purpose of teacher mentoring is to improve teaching and learning process. This study intends to look at areas of professional development where teachers need mentoring such as policies and procedures, stakeholders" expectations and analyses of related data such as documents on policy. Data will be analyzed and inference made. It is expected that mentoring will make teachers get job satisfaction and be effective in the teaching and the learning process.

Introduction

Mentoring can be defined defend as a process of nurturing in which a more skilled person serves as a role model by teaching, sponsoring, encouraging counseling and befriending a less skilled and less experience person for the purpose of promoting profession development and efficiency, Anderson (1988).

According to Gordon (1991) mentoring especially for beginning teachers is a critical component of the induction of new teachers into the profession. Mentoring makes the necessary connection between theory and practice, support the professional and personal growth of beginning teachers and provides professional development opportunities for the mentor teacher as well.

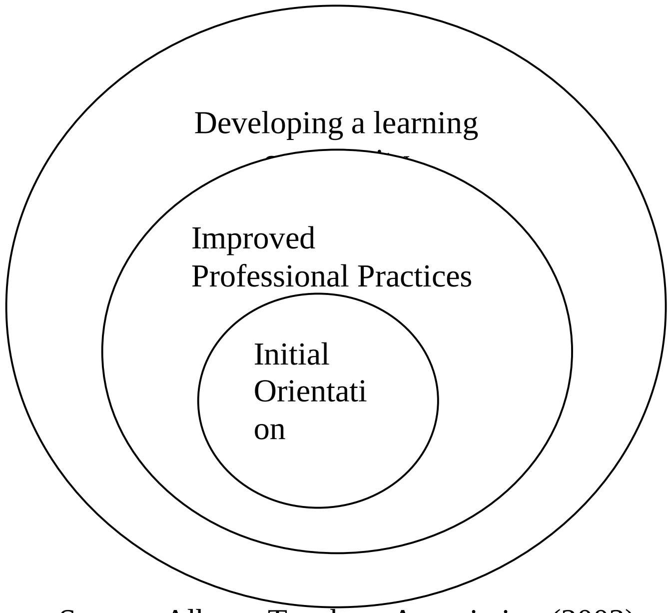
Teachers job in Kenyan secondary school like in other parts of the World as noted by Dan J.G. (2005) is an involving task, which includes learning new curricula, dealing with classroom management and discipline, integrating students' special needs, using technology, coordinating extracurricular activities and being accountable to various stakeholders of education. These duties are difficult for most experienced professional or seasoned veteran teachers. Therefore the need for effective mentoring of secondary school teacher's.

There are two types of mentoring programs, according to Podesen and Denmark (2000) i.e. formal and informal- Formal is official, with a program, mentoring and evaluation mechanism, while Informal is like learning on the job. Informal mentoring is common in Kenya. It has the following characteristics. New teachers often do not ask for help they need while experienced teachers do not want to Intrude. Beginning teachers just to observe effective teaching models from experienced teachers. Informal mentoring does not improve teaching overtime. Informal mentoring program are difficult to identify and support and in informal mentoring, the mentor does not grow professionally.

In Kenya there is need to move from Informal mentoring to formal mentoring. Formal mentoring benefits both the mentor and the protégé. The Protege reaches the competency level of the mentor but grows beyond the established baselines along the mentor. In formal mentoring, the mentor and protégé sour to new heights of professional growth and competence.

Mentoring of Secondary School Teachers is important in that, it serves to oriented new teachers to challenge of teaching by covering areas such as New work setting, new work culture of School Community and organization. New curricular and assessment process and teaching profession, Garvey (2000) observes that mentoring also improves professional practices by promoting effective teaching models and strategies as well as leadership and management skills and leads to life long learning orientation.

Figure 1: Demonstrates the Progression in Mentoring from in Initial Orientation.



Source: Alberta Teachers Association (2003)

Objectives of the Study

1. To establish that mentoring is important feature of the Induction of new teachers,
2. To identify benefits of mentoring to both the mentor and protégé,
3. To outline areas in which mentoring activities can be carried out.

Methodology of the Study

The study set out to investigate the role of mentoring in Secondary School of Kibwezi Sub County in Makueni County. The method of this study was descriptive survey. Orodho (2002) defines descriptive survey as a scheme, outlines or plan that is used to generate answers to research problems. These designs, Babbie (2002) notes combine the relevance to the research purpose with economy in the procedure. Descriptive survey as concurred by Kamau M (2014) seeks to obtain information that describes existing phenomenas by asking individual about their perceptions, attitudes, behavior or values. This design determines and reports the way things are and attempts to describe characteristics associated with target population.

Location of the Study

This study was carried out in Kibwezi Sub county of Makueni County Kenya, Kibwezi Sub County was selected because it has majority of Secondary Schools in Makueni County i.e 103 out of 302 registered Secondary Schools in the county. This accounts for 34%. The ideal setting for any study as observed by singleton (1995) is a location the researcher has interest in and as Mwiria and Wamaihu (1995) point out as an area that allows immediate relation with respondents. This sub county the researcher is familiar with and accords an acceptable environment to carry out the study.

Description of the Target Population

Target population has been described by Mugenda and Mugenda (2005) as the entire group of individuals or items under consideration in any field of iniquity. A list of all Secondary School was obtained from DEO office Kibwezi and three schools with highest number of teachers sampled (i.e., a boys school and a girls school and one mixed school with the highest number of teachers).

Sample Size

This study involved three public Secondary Schools one boys secondary one girls secondary school and one mixed secondary school In each ten teachers were sample in each school teachers who have worked for over ten years and five in their first three years of teaching Entiwinstile and Nisbet(1973) have noted that purpose in sampling is used when there exist reasons to limit the sample to achieve desired goals, arguments supported by Pattson (1990). These schools have more than 10% of teachers in Kibwezi Sub county, which as asserted by and (2009) is justifiable for the study as it is representative.

Research Instruments

The data collection was done using questionnaire and observation schedule. These two tools were supplemented by documentary analysis.

Literature Review

Mentoring takes two forms – the formal and informal. In the informal the protégé reaches the level of the mentor. However the mentor does not increase his/her competence. The informal mentoring is demonstrated by the figure 2 and 3 below:

The formal mentoring, process enables both the mentor and the protégé to reach higher competency levels. The mentor may share materials, but goes beyond sharing and increased the development of materials within a collaboration team. This required reflective practices, collaborative planning and action research compiled with a joint action plan by the mentor and protégé. Through this process both the mentor and the protégé sour to new heights of professional growth and competence.

Fig 2

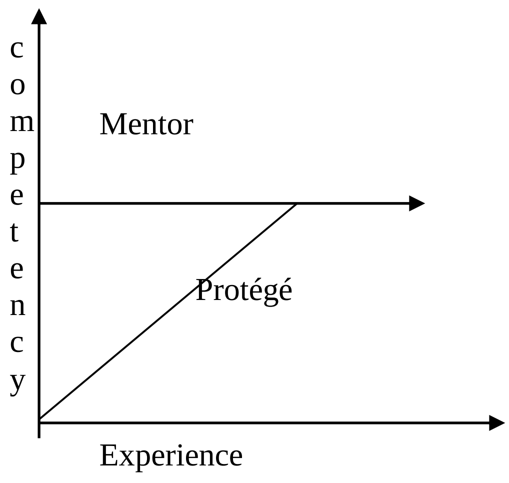
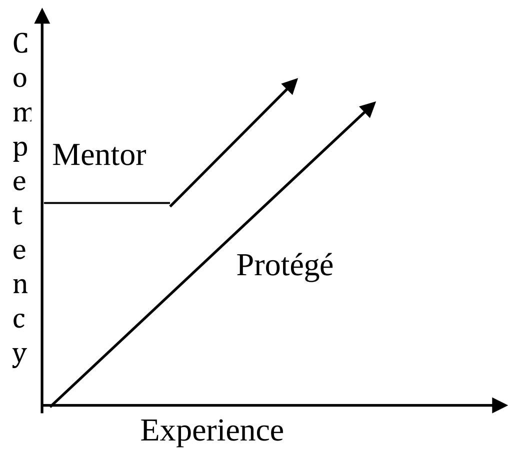


Fig 3



Source: Garvey (2000)

The overall purpose of mentoring in secondary school is to improve teaching and learning. Therefore mentoring is key to a successful induction process and without mentoring new staff takes considerable time to mentor the professional practice and learning, according to Gordon (1991).

Mentoring Context

Mentoring context contains a planning cycle with three areas in which beginning teachers need to be assisted according to Anderson (1988). These three areas are professional that cover expectation, polices and procedures and roles, rights, and responsibilities. Instructional level which involving deagonosing, presenting, evaluating and reporting on learning and finally personal and emotional dealing with moral support, befriendment wellbeing and encouragements. The mentor should provide more effective school based support to the beginning teachers while the protégé has a role to maintain a relationship with the mentor consistent with code of professional l conduct is noted by Eng (1992). The school administrator has a role to facilitate the process of mentorship within the school.

The Benefits of Mentoring

Mentoring has many benefit for different categories of education stakeholder as follows: For the beginning teacher, as observed by Albertor Teachers Association (2003) Accesses knowledge, experience and support of the mentor and this reduces stress during transition from beginners to experienced teacher: Kram (1983) adds that mentoring reduces trials and errors method of learning and accelerated professional growth, leading to successful induction into the teaching career.

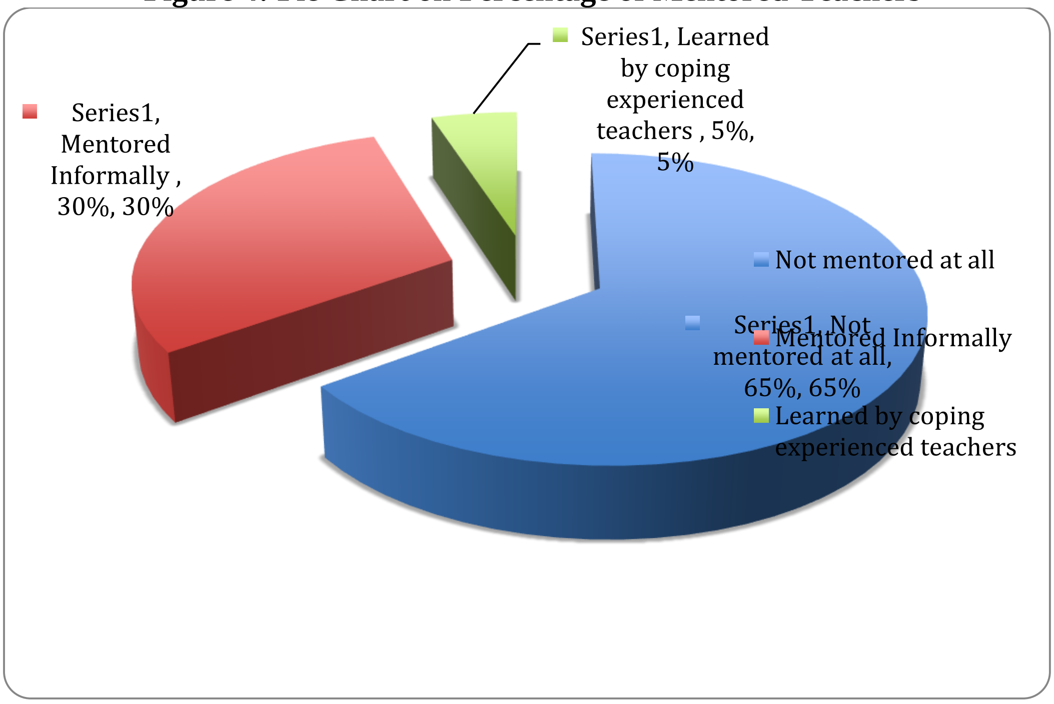
The mentor increases learning, research and teaching performance and as observed by podsen and Denmark (2000). The mentor gains recognition as an excellent teacher conferred through status as a mentor.

The administrator, Gordon (1991) states that benefits are that the new teacher gives better performance to the school. Mentoring benefits learners as they get better. Teachers who are less authoritarian and dominating and more reflective and disposed to continuous improvement by use of a wider range of instructional strategies and activities while the teaching profession benefits by retention of the best and most creative teachers who find new challenges and opportunity for growth by serving as mentors.

Data Analysis, Presentation and Discussion

From the three samples public secondary schools' the following were the findings. Figure on teachers who have been mentored.

Figure 4: Pie Chart on Percentage of Mentored Teachers



According to the percentage of the above findings, then it can be noted that there is no single case of formal mentoring going on in schools in the selected sample, with 2/3 of teachers reported that they were not mentored at all, while 1/3 only received informal mentoring.

Conclusion

It can therefore be concluded that in Kenyan Public Secondary School, mentoring is not taken as important part of induction of new teachers. A number of factors leads to this situation such as overloaded curriculum, examination based learning and poor coordination of induction of new teachers by both TSC and Ministry of Education.

Recommendations

1. The Ministry of Education in collaboration with TSC needs to organize mentoring programs for beginning teachers as part of induction.
2. School administration need to be in serviced and directed to ensure mentoring is part of the induction of new teachers and should select a team of experienced teachers and willing senior teachers to be mentors to beginning teachers.
3. Each sub-county and counties to select the teams of mentors, carry out workshops on mentoring and reward mentors.
4. There is need to publicizes the benefits that can be gotten from mentoring both by the mentor and the protégé.

References

Alberta Teachers Association (2003) Beginning Teachers Handbook Edmonton, Alberta.
Anderson E Annel (1988) “Towards a Conceptualization of Mentoring”, Journal of Teachers Education, American Association College for Teacher Education. Xxx1x: 1(January February 1988).
Babbie E (2002) Survey research methods. (2'** Edition) Belmont; wodsworth. '
Delm J Garvey (2005) Mentoring Beging teacher, programs, Hardbook, The Alberta Teachers Association.
ENZ b (1992) “Guildelines for Selecting Mentors and Creating an Environment for Mentoring, Virginia, Reston.
Entusslte H and Nisbet (1973) Educational Research Action London, University of London press Ltd.
Gordon T and Stephen P (1991) How to help beginning teachers to succeed. ASCD, Alexandria
Gordon Thomas (1996 - 1998) Mentorship program model project Alberta.
Orodho, AJ & KOMBO D.K (2002). Research methods, Nairobi Kenvatta University, Institute of open learning.
Kamau M.W (2014) factors affecting attitude and perception of mathematics among girls Secondary- Schools of Westlands District, Nairobi County, Kenya.
Kram K (1983) “Phases of Mentor Relationships” Academy of Management Journal 26
Mugenda OM and Mugenda A.g (2003) Research methods, Quantitative and Wualitative Approaches, Nairobi Acts press.
Mwaria K and Wamahiu PS (1995) issues in educational research in Africa, Nairobi East Africa educational publisher Ltd. Bricks Con ot.
Patton MQ, (1990), Qualitative evaluation methods sage publisher inc. GRAY D (2009) Doing research in real word London sage.
Podsen and Denmark (2000) Coaching and Mentoring First Year Student Teachers.
Singleton R.A (1993) Approaches to Social Research New Yolk. Oxford University Press.
www.gse.uci.edu/mentor teacher/content/contents.html.

MOVING FROM PILLAGE OF RESOURCES IN SECONDARY SCHOOLS BY PRINCIPALS TO TRANSFORMATIVE LEADERSHIP BY CHOICE KIBWEZI SUB COUNTY IN MAKUENI COUNTY KENYA

Leonard Mwangangi
Kenyatta University
dkhatete@yahoo.co.uk

Henry Ayot
Kenyatta University
hoayotk@yahoo.com

Mueni Kiio
Kenyatta University
dr_mueni@yahoo.com

In Kenya, every year there have been complains and cries about how secondary education is managed at various levels, such as from a selection of form ones, charging of secondary fees, a financial management and the general management of secondary schools resources for effective teaching and learning. School assessment reports in different schools every time they are conducted raise pertinent issues of poor managerial skills, exclusive leadership by school heads, open defiance of ministry's policies, guidelines and expectations. This has resulted in running down of some secondary schools. This paper intends to examine causes of looting secondary schools, methods of looting and propose remedies to this looting of public secondary schools. The designs of this study will be survey involving 10% of the 68 public secondary schools in Kibwezi Sub-County, Makueni County, sampling method to be employed will be purposive in that schools, that have been assessed in the last two will be purposely sampled and schools that have recorded good academic performance and steady school development. This study expects that the findings will enable the management of secondary schools to move from looting of schools resources by school heads to transformative leadership by choice that will result in effective teaching and learning. The study will examine data. Quality assurance and audit reports, BOM reports/ minutes, observation schedule of sampled school, as well as questionnaire for teachers in sampled schools. The overall significance of this study will be improved quality of education in Kibwezi sub County and in Kenya.

Introduction

Education is recognized world wide as an investment whose productivity lead to rapid economic and social growth, however the investment is so enormous in terms of finances, human resources and infrastructure for this reason according to Francis et al (2013) the Government of Kenya introduced cost sharing policy in funding secondary school education in order to share the cost with the community.

School principals have been reported in their conferences complaining that government grants to secondary schools is not enough and to meet the deficit, many secondary schools have increased their fees beyond the fee guidelines given by ministry of education. This has raised a storm in education sector, with ministry of education maintaining that the guidelines must be followed, while secondary school principals through their National Association and with support of teachers Union KNUT argue that the fee guidelines and Government grant does not reflect the actual cost of educating a student in Kenya as reported in (Daily Nation of 12th June 2007).

The ministry of education reviewed the fees guidelines in 2009 and again in 2012 and the Government subsidies increased from 10,200 per student to 12,800 per year (Republic of Kenya MOE 2009). It is interesting to note that public secondary schools continue to run their annual program despite the divergence views on the actual cost of education and so far no secondary school has been reported closed down due to inflation or failure to collect all projected income as an adequacy of funds. This as observed by Francis et al (2013) implies that the insight of Public secondary schools revenue and budget management is unknown, inline with this argument this study set to find out how principals use schools resources, particularly finances as reflected in school annual budgets and ways in which management of schools resources can be mobilized and utilized in a manner that is transformative for the good of the overall school community.

It is evident and a worrying trend that schools assessment reports majority raise issues of poor managerial skills, principals who practice and have perfected exclusive leadership and defiance of ministry of education policies, guidelines and expectations. A small number of these principals face disciplinary action such as transfers or demotions, however majority use school funds to buy retention in same schools or promotions to other prestigious schools, in such cases the big questions remain, why the looting, how can it be remedied and transformed.

The national parents association of Kenya, according to its secretary general (2015) is concerned that the government since 2003 has been channeling billions of shillings to both primary and secondary schools, to support FPE and FSE programs and other funds that have been channeled for infrastructure, computers, fire fighting equipment, lab equipment among others. It is quite unfortunate that independent mechanisms have never been put in place by the Government to monitor how the funds are being spent and because of that anomaly there have been cases of mismanagement of the funds. This has been occasioned by the fact that there are no enough auditors in the districts to check on financial mismanagement. According to National Parents Association (2015). There is only one auditor surveying over 400 schools, therefore no effective monitoring of resources especially financial. Because of this need KNAP has employed independent monitors in every constituency to monitor how devolved funds are being used. KNAP share reports collected by these monitors with ministry of education officials.

KNAP (2015) has observed that a big number of teachers and parents are ignorant of many policies that the ministry of education has been formulating. This has lead to mismanagement in schools by school principals. It is worthy noting that KNAP has embarked on educating parents and teachers on various education policies to address the gaps in management of secondary schools.

Objectives of the Study

1. To establish causes of looting of public secondary schools funds.
2. To identify ways in which principals use to loot schools resources.
3. To suggest ways in which pillage of school resources can be remedied.

Methodology of the Study

This employed descriptive survey Orodho (2002) defines descriptive survey as a scheme or plan that is used to generate answers to research problems. Descriptive survey combines relevance to research purpose with economy in the procedure as noted by Babbie (2002). It also seeks to obtain information that describes existing situations by asking individuals about their perceptions, attitude and behavior. As observed by Kamau (2014) survey design reports the way things are and describes characteristics associated with target population.

Location of the Study

The study was carried out in Kibwezi sub County of Makueni County. This location was conducive for the researcher as observed by Mwiria and Wamahid (1995) in that an area of study should be one that allows immediate relationship with respondents and as noted by Singleton (1995) an area in which the researcher has interest. The researcher has interest in Kibwezi subcounty as a resident and educational practitioner in the same area.

Description of the Target Population

The target population for this study was the 68 registered public secondary schools in Kibwezi Sub County. This as stated by Mugenda and Mugenda (2005) as the entire group of individuals or terms under considerations in any field of inquiry. The schools in Kibwezi County are Boys, girls or mixed public secondary schools and a list of the school was obtained from office.

Sample Size

This study involved three schools, a boy's, a girl's and a mixed public secondary school. This was a purposive sampling targeting schools with evidence of pillage of resources by school principal as reported by assessment reports, entistle and Nisbet (1973) have observed that purposive sampling is used when there exist reasons to limit the sample to achieve desired goals.

Research Instruments

This study used Questionnaire and observations schedule to collect data and supplemented the data by documentary analysis, particularly assessment reports and BOM minutes.

Literature Review

Pillage of resources refers to a situation in which a person or group of people steal things or loot resources from a place with intention to destroy after destruction according (oxford dictionary). This is the kind of situation that has obtained in some public secondary schools in Kenya where principals loot schools resources as if they intend to totally destiny the school or as if the school was already destroyed and they are just concluding the destruction. This practice according to the constitution of Kenya (2010) is against chapter six of the constitution on leadership and integrity.

Ways in Which Principals Pillage Resources

There are various ways in which public secondary school principals pillage resources. According to Mutua (2015) in an article on "state to blame over exorbitant school fees" in the standard newspaper, schools charge huge fees, coming up with dubious school projects as buying buses. In fact on the buses it is not for the benefit of the school community but an avenue of collected personal revenue through hiring out and overcharging on unjustifiable maintenance as well as 10% which accompanies purchase of the said buses, no wonder, every public secondary school has a bus or is in the process of acquiring one.

Mutua (2015) has noted that it is not strange that even some schools have two buses yet learners live in overcrowded dorms and lack many basic facilities. This situation and many others can squarely be blamed on ministry of education and BOM that have failed in their oversight role.

Other ways of pillage of resources by schools principals as reported in assessment reports (2015) include: spending school funds on items not on schools annual budget and without approval of BOM, overpricing of items and projects, procuring substandard items and allowing substandard projects. Investing in non priority areas which are easy catch for cash, and claiming donations to have purchased schools such as fire fighting equipments when in reality these were donations to the schools and failure to create an effective school property inventory with intentions to carry away school items.

Causes of Pillage of School Resources

There are many factors that contribute to pillage of school resources by principal these include but are not limited to: Inadequate assessment and audit of schools. According to KNAP (2015), there is only one auditor for every four hundred public secondary schools. According to Mutua (2014) "Talking point" in the standard, poor planning, and corruption accounts for pillage of school resources as well.

It is also been argued that some ministry officials are compromised by school managers as well as TSC failure to vet school principals especially on their sources of overnight wealth acquisition and finally peer pressure among the principals that you must pillage resources from schools because you are a principal for a season to secure your future. Principals also share ideals on how to pillage resources.

Data Analysis, Presentation and Discussion

Table on sampled school and compliancy with MOE fees guidelines.

School	Category	Frequency	Compliancy	Non compliancy	% Of compliancy
Public boys school		3	1	2	33.3
Public girls school		3	2	1	66.6
Public mixed school		3	2	1	66.6

From the above table it can be noted that compliance with ministry of education fee guidelines is low and particularly with boys secondary schools. It was observed that in addition to normal fees there are other hidden charges given different titles such as KCSE conduct, Extra conduct, computer fees etc. which raises the cost of education. These no compliancy and other hidden costs have made secondary education the most expensive sector in education system according to Mutua (2015). These additional fees are the sources of pillage of schools resources.

In one of the assessment reports for school, the principal from auditors report is alleged to have misappropriated and embesized school finances amounting to approximately Ksh 3 million in the year 2014 alone and the amount is expected to be recovered from the teachers salary.

Conclusion

It is a fact that there is a problem of pillage of resources in secondary schools. A number of schools are poorly managed and run in a way that it is like there is deliberate effort to destroy them. Assessments of schools are not being done as per expectation leading to pillage of resources.

Recommendations

1. Ministry of education to recruit more quality assurance and auditors officers.
2. BOMs and PTA to be concerned and play their oversight role in management of school resources.
3. The ministry of education to ensure there are impromptu assessments and audits of schools records.
4. Public to educate on their role in checking how schools in their locality are managed and raise he flag incase of mismanagement.
5. Secondary school principals to be veted and recruitment of new ones to be done competitively through interviews.
6. Post of principal to be on contract of five years as proposed by (MOE 2014) and only renewable based on performance.

References

Francis C, Shikad S, Odebero S and J Byruhanga 2013. Role of ministry of Education fees guidelines in management of annual school budges in Public secondary school. Education News Nairobi.
KNAP (2015) A profile of the National Parents Association of Kenya KNAP Nairobi.
KNPA (2015). A profile of the National parents Association of Kenya Nairobi.

Laws of Kenya, Constitution of Kenya (2010), chapter six a leadership integrity, Uraia Nairobi.
Mugenda M and Mugenda AG(2003). Research methods Quantitative and Qualitative approaches, Nairobi Act Press.
Mutua P. 2014. Talking point Nation Newspaper. Fine 2014.
Mutua P (2015) State to blame over exorbitant school fees standard news paper 6th February 2015.
Mwiria K. Wamalich P (1995) Issues in Educational research in Africa. Nairobi, East African Educational Research in Africa, Nairobi, East African Educational Publishers Ltd Bricks.
Republic of Kenya (2005). Hand Book of financial management Instruction for primary schools. Nairobi government printers.
Singleton RA (1993). *Approaches to Social Research*. New York: Oxford University Press.

GRAFFITI WRITING AND ITS LIKELY INFLUENCE ON ENGLISH LANGUAGE LEARNING IN SELECTED SECONDARY SCHOOLS IN THE LARGER LAIKIPIA EAST DISTRICT, LAIKIPIA COUNTY, KENYA

Francis Gichuki Mwangi
Kenyatta University
mwangifg@gmail.com

Agnes W. Gathumbi
Kenyatta University
agnesgath@gmail.com

Adelheid M. Bwire
Kenyatta University
addiemarie@gmail.com

The study was aimed at identifying the communicative strategies employed in graffiti writing and the influence of graffiti on learning of English language in our schools. Graffiti texts were collected in ten secondary schools purposively sampled in the Larger Laikipia East District. Out of 1000 graffiti texts collected, 200 were randomly sampled for analysis. Twenty English teachers were purposively sampled to take part in an interview. One hundred students were randomly sampled to fill in questionnaires. A Focused Group Discussion (FGD) was carried out with a group of five students randomly sampled in each school. The findings of the study were that students used varied communicative strategies like humor, symbolism, irony, short forms and abbreviations in their graffiti writings. The findings of this research may contribute to the study of sociolinguistics in general and communication in schools in particular.

Key words: Graffiti, Communication, Sociolinguistics

Introduction

Graffiti (singular, graffito) refer to writings or drawings scribbled, scratched or sprayed on a wall or a public space. Graffiti are any type of public markings or written words that appear on walls of buildings. Graffiti have existed since ancient times, with examples dating back to ancient Greece and Roman Empire. In the modern era graffiti have been used as a mode to pass socio-political messages in an artistic form. Its growth into urban culture has been fuelled by the evolution of hip-hop and other urban cultures (Ferrell 1993. Though celebrated by many, graffiti is a constant point of disagreement between the artists and law enforcement officers. Elsewhere in the world, graffiti have been used to pass radical political and social change messages. For instance, during the Arab Spring, Egyptian graffiti artists played a huge role in expressing the mood of the country through their caricature of former president Hosni Mubarak.

According to Nwoye (1993), wall writings and drawings have been used for a long time by various groups of people in the society who in one way or another feel oppressed. Such groups of people who are prohibited from, or denied avenues of public space for expression seek other avenues and often graffiti on the walls of public places becomes a favoured option. Nwoye (1993) points out that student population in most parts of the world is one such group that feels it does not enjoy the privilege of public self-expression. Many students opposing the school system may not come out openly but may express their anger in graffiti for fear of the consequences. In writing graffiti students may use codes that are uniquely understood by the writer and the targeted audience. (Ferrell 1993) claims that Graffiti can naturally be viewed as a contemporary type of expressive opposition to authority; though each graffito contains a complex message of its own, there is the simple implicit assumption that every graffito opposes authority. To avoid falling victims to the system if they complained, students resort to writing graffiti to express their discontent with the system. They feel they have been oppressed and avenues for expressing their opinions blocked. The Larger Laikipia East District is in Laikipia County and is a semi-arid region. It is classified as an ASAL region. Due to this reason students undergo various hardships both at home and in schools which could be explained by the graffiti they write.

Purpose of the Study

The study leaned on sociolinguistic approach to the study of graffiti whose purpose was to investigate and analyze writing of graffiti and how it influences Learning of English language in secondary schools in the Larger Laikipia East District in Laikipia County.

Objectives of the Study

The study was guided by the following objectives:

1. To identify the graffiti communicative strategies used by students.
2. To speculate on how graffiti is likely to affect learning of English language and classroom learning environment.

Research Questions

The study attempted to answer the following research question:

1. What specific communicative strategies are employed in graffiti writing?
2. What is the likely influence of graffiti on learning of English language and classroom learning environment?

Conceptual Framework

The below framework shows the independent variables in this case the normal or ordinary communication strategies used by school administrators and teachers while dealing with issues that affect the students. These variables were communication strategies like letters, posters, verbal, and suggestion boxes that are legitimate avenues presented to the students for communicating with the school management. These independent variables were investigated to establish whether they cause students to communicate using graffiti. The dependent variable was the graffiti codes written in various areas by the students for communication purposes. Extraneous variables teacher characteristics. leadership styles. Democratic, authoritarian counseling services offered in the school.

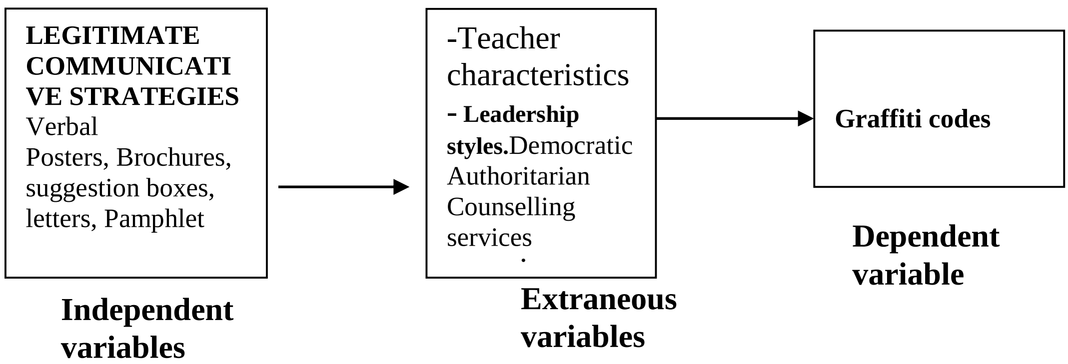


Figure 1: The Diagrammatic Representation of the Relationship between the Independent, Extraneous and Dependent Variables of the Study Derived from General System Theory

Research Methodology

Research Design

This study used a survey design. They are an efficient method of collecting descriptive data regarding the characteristics of the population and the current practices, conditions and needs (Sherman et al, 1988). A descriptive research using both quantitative and qualitative data analyses was adopted in this study. Qualitative research enables one to study things (Mugenda & Mugenda 1999).

Target Population

The target population for this research was the graffiti texts, students and teachers in all secondary schools in The Larger Laikipia East District. This is the population to which a researcher wanted to generalize the results of the study. The total target population was about ten thousand eight hundred secondary students.

Sampling Technique and Sample Size

Ten secondary schools were purposively sampled from across the four divisions namely Lamuria, Central, Daiga and Mukogodo divisions. The research specifically targeted ten schools that had experienced unrests, go-slows or other forms of students' disturbances both internally and externally in the last three years. The sample size was 150 out of 3931 secondary school students in the district.

Sample of Respondents

The ten students in each of the ten schools sampled were used to fill in the questionnaires and assisted the researcher in interpretation of graffiti writings in their individual school after collection of the graffiti texts by the researcher. The researcher collected one hundred graffiti texts in each school and randomly sampled twenty which was 20% of the graffiti collected. Another five students were randomly sampled in each of the ten school sampled to be involved in a focus group discussion on graffiti in their school with the researcher acting as the facilitator. Twenty English language teachers in ten schools were also purposively sampled to take part in an interview because they had the knowledge on English second language learning and thus could give opinions on how graffiti writing influenced learning in their schools.

Sampling Graffiti Texts

The researcher collected the graffiti texts from different locations and entered them in a graffiti collection guide prepared by the researcher. The student assisted the researcher in graffiti interpretation and décoding the messages contained in the graffiti writings. From these graffiti texts collected the researcher sorted out and randomly selected 20% of graffiti texts collected in each school for analysis. The data elicited from graffiti text assisted the researcher to establish the types of graffiti and messages students communicated through writing of graffiti. This data also assisted the researcher to identify the graffiti communicative strategies or codes used by students. A camera was used to record graffiti which the researcher found a bit challenging to sketch due to the nature of their location. So in total two hundred graffiti texts were analyzed for the purpose of this study. The texts sampled were treated as being representative of graffiti texts in the whole Laikipia County.

Instrumentation

In this section, the tools used for the collection of data are analyzed and the data elicited by each instrument discussed.

Questionnaires for students. A questionnaire is a tool that gathers data over a large sample (Kombo & Tromp, 2006). The questionnaires administered to students attempted to gather data on the type of graffiti they wrote in order to communicate and their views on how the administration responded to graffiti writing. Data elicited from these students questionnaires helped to estimate the extent of graffiti writing in these schools and motives for writing the graffiti texts. The data elicited by this research instrument also helped the researcher to get insights on the nature of problems and needs the students were facing in schools.

Interview schedule for teachers. Two language teachers in each school were purposively sampled so as to participate in an interview with the researcher. The questions posed to English language teachers during the interview were meant to establish whether graffiti writing in schools had any influence English language in schools. The interview with the English language teachers was also expected to elicited data on whether graffiti writing by students had an influence on classroom learning environment.

Respondents for focus group discussion. The researcher carried out a FGD after randomly sampling five students across the forms because each form had unique characteristics. All the students were interviewed collectively. After reading through the graffiti texts collected, permission was sought from the students and the school heads to record the students assuring them that the recording was purposely for research only. The interview was more like a guided discussion among participating members with the researcher acting as the facilitator. FGD is best suited for obtaining data on group attitudes and perceptions (Mwiria & Wamahiu 1995). The purpose for tape recording the FGD was to enable the researcher to replay the tape later during data analysis to confirm opinions of the students.

Results

Graffiti Communicative Strategies used by Students

This section deals with the communicative strategies used by the graffiti authors in secondary schools to pass their messages across.

Humor. Students in graffiti writing to elicit laughter used this communicative strategy. Some students just wanted to make fun and make others laugh:

WARNING

Lack of sex leads to
Blurred vision

The above graffito was collected from the laboratory of a boys' secondary school. Though it is a misconception, the writer is aware that what he stated was not true but wanted to make fun that if one failed to engage in sex he would have blurred vision.

Symbolism. Symbolism is also a communicative strategy that graffiti writer use to communicate their message. Symbols are used to express deep concepts and ideas by graffiti writers.

The sketch or drawing of a heart is generally used to symbolize love the first writer uses the drawing to declare his love for Nimo which is the short form for a kikuyu girl's name (Wairimu).The second writer understands what the symbol means and below it scribbles "me Christine "meaning he loves Christine.

Irony.

White house

This graffito was written on the wall of a dormitory that was somehow neglected for along time without paint and the floor was bad shape. The writer tried to contrast this dormitory with the white house that houses the sitting president of the United States of America. In this case the writer appeared to complain to the school administration to improve the condition of this dormitory.

Imagery. Graffiti writers also used imagery to pass their messages by comparing what they communicate with known images. Mostly students appeared to use metaphors to communicate their thoughts. *WELCOME TO HELL 2W* found on a wall in a class in a mixed secondary school likened class **2W** to hell due to noise making that originated from that class. *MONO ni ngui (mono is a dog)* was an insult towards form ones, the writer likened the form ones to a dog which eats dirt and could be bitten at will. This out rightly showed that students in upper classes hated form ones and this hatred sometimes led to their molestation.

Short forms, acronyms and abbreviations. Students also use short forms, acronyms and abbreviations as a communicative strategy in graffiti writing. These short forms, acronyms and abbreviations are used in graffiti writing because the graffiti writers are in a hurry to communicate for fear of being noted.

Enjoy luv Hear! love base -use luv instead of love
Aspire 2B morrows` Ocampo—use 2B instead of to be
Am proud of my virginity
Who asked U?
What a mile!

Clipping of words is also a form of short form used by students in writing of graffiti. This term refers to words that are shortened with no loss in their original semantic value. However, clippings give a colloquial or familiar flavor to one's speech, something that appeared common with graffiti written by students. *SUE is a hoe that can never say no***.** This graffito was found in a toilet in a mixed secondary school. There is some form of clipping as the writer had intended to write the word *whore* which pronounced almost the same as the *hoe***.** (*Ho) hoe* has lost the initial ***w*** and the vowel **/o/** is realized as **[ow].**

Acronyms. These formations are made up of the initial letter or letters of successive terms. Acronyms abound in English since speakers of that language are fond of their use. The graffito below acronym *FBI* was found in the library in a girls' secondary school and it appears to encourage students to be focused in their studies so that they can achieve more than they can imagine.

Focus
Beyond
Imagination.

Abbreviation. Students also wrote graffiti in form of abbreviations. These abbreviations appeared in the form of symbols, letters, and pictures which represented whole words. Pictures and numerals as representations for words were also observable in graffiti writing by students. *I ♥ NIMO* The shape of the heart in the graffito found above symbolizes love. The graffito was found in a class in a mixed secondary school. It was a declaration of love one had for Nimo.

These short forms, acronyms and abbreviations are indication of the limited time the writers have to communicate and secrecy involved in graffiti writing for fear of being punished. The students applied the above communication strategies to communicate their thoughts.

Speculation on Influence of Graffiti on the Learning of English Language

To be precise 12 out of 20 **(60%)** of the teachers interviewed indicated that learning of English in schools was influenced by graffiti writing. Though there could be other causes of poor English mastery in class like use of ***Sheng*** (colloquial) and SMS texting, graffiti writing was said to be one of the causes. Most of English teacher respondents concurred that influence of graffiti writing were captured in composition writing. Most of grammatical mistakes written in graffiti in classes were reflected in composition writing.

enjoy luv Hear! love base

The words *luv* should have been written as *love* and *hear* should be *here***.** This clearly shows that some students confuse the homophones hear and here.

lyfe ni hard hold tight (life is hard continue with the struggle because it is full of obstacles)

This graffiti writer has a misspelt word *lyfe* instead of *life***.** This is a common peculiarity in graffiti writing styles (sociolinguistic mode of communication) where letters are deliberately omitted, interchanged or mixed (small and capital letters) in order to attract the attention of the graffiti readers. This over use of graffiti writing styles through deliberate or erroneous omission of letters in words was reflected in writing of composition as errors according to 12 out of 20 (60%) of the English teacher respondents.

Students also wrote graffiti in *Sheng* (colloquial) that affect their composition writing and language mastery. About 10 out of 20 (50%) of respondents agreed that graffiti affected composition writing.

Tusome tuwe sonko (lets us learn we become rich) *sonko* is the *sheng* word referring being rich. Use of words written in sheng was a common feature in composition writing.

Graffiti writing has also *influence* on learning of English language in that students' weaknesses in spelling and usage of words are revealed. About 10 out of 20 (50%) of the teacher respondents were of the opinion that students level of mastery of language spelling vocabulary and sentence construction could be established through observation and analysis of graffiti written in their schools. The graffito that follows was collected from a class in a boys' school is an example of such graffiti.

Danger Trudgedy

Memo 24th octomber sato strike. (The word October is misspelt)

The graffito above was picked from a class in a mixed secondary school. Through this graffiti students' mother tongue interference could be easily noted through misspelling of the word *October* by adding bilabial nasal /**m/** before bilabial plosive **/b/** sound. There is also confusion in the use of homophones in English amongst students that is also captured in graffiti writing.

IDLE mind is THE DEVILS WORKERSHOP.

The word workshop is *misspelt* through addition of ***-er*** to form a compound noun workshop. Use of short forms and ampersands (&) appeared common in graffiti and that this affected writing in English compositions. The grammar is mostly affected when students resort to use of short forms in composition writing.

TRUST IN JEHOVAH & U WILL BE A WINNER
During preps I read and erect like hell
Please adduce!
Fuck your BUKZ

The word BUKZ is used instead of BOOK. Student weaknesses in pronunciation of English words are also captured in graffiti.

Mavocabulary
Chow, nyama shoma
cugar chame on u
fiching

The above graffito was collected from the laboratory in girls' secondary school. The writer appeared to make fun of some students or even teachers with difficulties in pronunciation of /s/, /sh/ and /ch/ sound.

Some student pronounce the words, *CHOW INSTEAD OF SHOW, CUGAR INSTEAD OF SUGAR, FICHING INSTEAD OF FISHING, NYAMA SHOMA INSTEAD OF NYAMA CHOMA, (ROAST MEAT), CHAME ON U INSTEAD OF SHAME ON YOU.* Once these students are mocked on the word and their weaknesses exposed they shy away from speaking English in school. It has been found that graffiti writing in school by student has both positive negative effects on learning of English language in school.

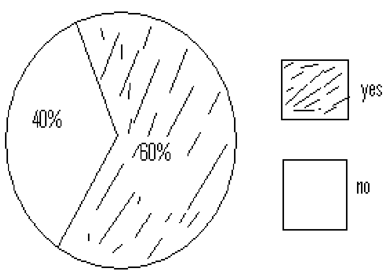


Figure 2: Influence of Graffiti on Learning of English Language in Schools

From above figure 2, 12 out of 20 **(**60%) of the English teacher respondents interviewed agreed that graffiti influence learning of English language while 8 out 20 (40%) of the respondents disagreed that graffiti writing in schools had any effect on learning of English in schools. About 7 out of 20 (35%) of the English teachers interviewed confirmed that some graffiti text affected classroom learning environment. Only 1 out of 20 (5%) of the respondents were of the opinion that graffiti did not affect classroom learning environment at all. About 12 out of 20 (60%) of the English teacher respondents did not respond to the question. Of those English teacher respondents who were of opinion that graffiti writing affected classroom learning environment, about 4 out of 7 (57%) of them said that graffiti writing affected classroom learning environment both positively and negatively. Most English teacher respondents were of the opinion that positive graffiti on wall like those that encouraged other student to work harder reinforced learning.

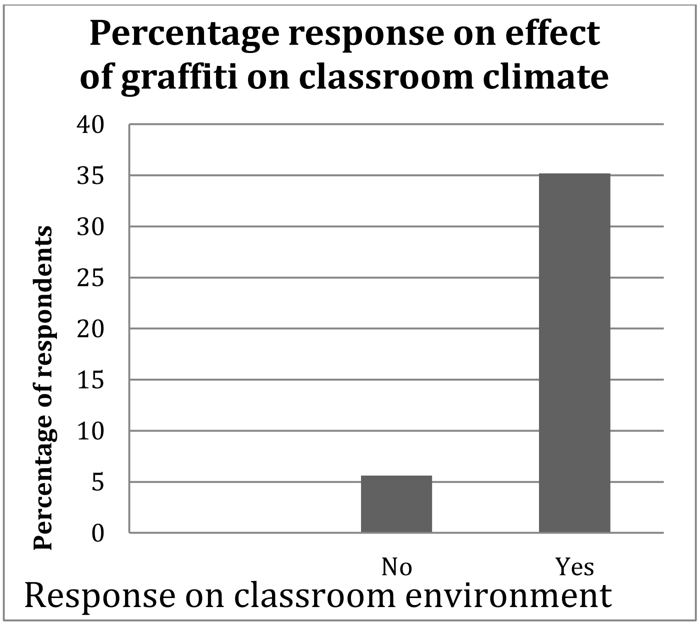


Figure 3: Effect of graffiti on classroom climate

The graffiti below are examples of graffiti that were said to have positive effect on classroom learning environment. These graffiti were 15 out of 200 **(7.5%)** graffiti sampled for the study.

REJOICE comes after suffering

The above graffito *REJOICE comes after suffering* was picked from a class in a girls' secondary school and it served as a reminder to students in this particular class to concentrate in their studies so that they can rejoice once they succeed in their academics.

There was general consensus among English teacher respondents that the presence of graffiti writing in the classroom written in vulgar language created on atmosphere of an indisciplined class and this affected the morale of teachers hence delivery of content. Most of the teacher respondents were of the opinion that graffiti referring to sex, drugs, hate, conflict and insults had a negative influence on classroom learning environment. The graffito below was collected from a form two class in a mixed secondary school. 2 out of 2 (100%) of English teachers interviewed in this school cited this graffito as one of the types of graffiti writing that irritated them and made them have very low opinion about the class thus affecting classroom learning environment. The graffiti below were also found in classes and according to 16 of 20 (80%) of English teacher respondents agreed had a negative effect on classroom learning environment. Apart from giving the classes negative publicity and impression they also reflected cases of sexual harassment and bullying in these classes.

You mono you are HOT SEXY GIRL
MONO ni Ngui (Form ones are dogs)
2010 MONO WAFALA (Form ones are fools)

Discussion of the Results

Communicative Strategies used by Students in Graffiti Writing

The study also sought to establish the communicative strategies used by students in graffiti writing. The study found humor, symbolism, irony imagery, short forms, acronyms and abbreviations as strategies used by students to communicate their feelings about themselves and the outside world. It was noted that some graffiti messages were written in these codes or in a cryptic manner and that they had to be read keenly to be understood. Students used these strategies to communicate messages on celebrities, food, drugs, television programs, emerging issues, political philosophies, religion, sports, dissatisfaction with the authority, territorial markings, sex, slogans and general comment. Graffiti written by students is rich in information and depicts thoughts and feelings which may express group as well as individual identity. Alonso (1998) sums up this important role of graffiti. He asserts that graffiti analysis can serve as an excellent tool in understanding behavior, attitudes and social processes of certain segments of society.

Speculation on how Graffiti is likely to Influence the use of English Language in the Classroom and Classroom Environment

The findings of the study were that graffiti texts influenced the learning of English language and classroom learning environment. It was established that graffiti writing affected the writing of compositions and also helped to identify students' weaknesses with regard to language use like pronunciation of words. Influence of graffiti writing that was captured in composition writing was rampant errors of omission and commission, mistakes in the use of homophones, use of ampersands, short forms, abbreviations and mistakes in the use of possessives and contractions. Poor mastery of pronunciation of words was also reflected in the nature of graffiti writings that students wrote. The study also found that the presence of graffiti writing in the classroom written in vulgar language created on atmosphere of indiscipline in class and this was likely to affect the morale of teachers hence delivery of content. This study attempted to speculate on the how graffiti writing was likely to affect learning of English language in the classroom. Graffiti studies done earlier, found graffiti to be a useful tool in the study of comprehensions and novels. The study dealt on application of graffiti text coding in classroom learning. According to (Buehl 2004), Graffiti Text coding involves highlighting or marking a spot in a paragraph and then jotting a symbol in the margin to indicate the kind of thinking that was elicited at that point of reading. It focused on thinking such as making connections to background knowledge and experiences, posing questions, identifying confusions, making inferences, determining importance, and summing up key ideas.

Conclusion

1. Students used varied communicative strategies in their graffiti writings.
2. Graffiti influenced learning of English language in secondary schools.

Recommendations

1. Issues raised by students in graffiti to do with hatred, conflict and dissatisfaction with the school administration be addressed to avoid strikes or unrests in schools.
2. The English teachers should identify students' weaknesses in language use through observation and analysis of graffiti writings in their schools.

References

Alonso, A. (1999). *Territoriality among African American Street Gangs in Los Angeles*, Unpublished Masters Thesis, Department of Geography, Los Angeles: University of Southern California

Ayot, H.O. & Patel .M.M (1992*)*, *Instructional Methods*, Nairobi: Educatioal Research and Publication LTD

Buehl,D. (2004*). Using Graffiti as a reading tool*. New York: On WEAC in Print, 4(8),13

Coolican, H, (1994). *Research Methods in Psychology*, (2nd ed.). London: Hodder and Sloughlon.

Day, N. (1996) *Violence in schools*: learning in Fear. Berkeley Heights, NJ: Enslow Publisher.

Ferrell, J. (1998). *Freight Train Graffiti: Subculture, Crime, and Dislocation*. Justice Quarterly 15.4 597-608.

Gall, M.D., Gall. J,P. & Borg, W.R., (2003). *Education Research: An Introduction* (7th ed) New York: Person Education Inc.

Hoffman, A. (1996) School, Violence and Society. West Port. Paeger

Kombo,D.K.& Tromp, D.L.A.(2006) *Proposal and Thesis writing. An introduction*. Paulines Publications, Africa, Nairobi.

Mugenda, A. & Mugenda, O., (1999). *Research Methods; Quantitative and Qualitative.* Nairobi: Acts Press.

Mwiria, K & Wamahiu S.P.(1995) Educational Research Network in Kenya, East African Educational Publishers, Nairobi. Kenya

Niemann R, et al (2002)|. *Objectivity, reliability and validity in qualitative research.* South Africa*:* South

Nwoye ,O. (1993). *Social Issues on Walls*: *Graffiti in University Lavatories Discourse and Society*, Vol. 4(4) 419 -442, New Delhi, India: Sage.

Phillips, S. & Wallbangin, A.(2004). *Graffiti and Gangs in L.A*. London: University of Chicago. African Journal of Education, 20(4): 283 – 286.

Rothman, E. (2002). *Graffiti Art Therapy*, Janice Hoshino, New York

Sherman,R,R,.& R.B. Webb,ed 1998 *Qualitative Research in Education*; Focus Methods. London: Falmar Press

APPRAISAL OF THE ADEQUACY AND IMPLEMENTATION OF THE ENGLISH CURRICULUM IN BURUNDI STATE PRIMARY SCHOOLS

Marie-Immaculee Ndayimirije
Kenyatta University
marimakula@gmail.com

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

The 2005 measure in Burundi to introduce English language teaching at primary level without prior and inclusive consultations with those primarily concerned with its implementation was followed by a set of challenges of which shortage of books and non-preparation of teachers gained visibility and have been gradually addressed. The quality of the curriculum itself and of its implementation have, however, been neglected. This study set out to investigate their adequacy and effectiveness in addressing the goals intended for this programme. The investigation was conducted using questionnaires to seek the views of the teachers, school principals, and curriculum developers on its various components, a content analysis guide which covered all textbooks used at this level; and a classroom observation checklist for use with 5th and 6th Grade classes. The population sample included 371 teachers of English and 80 school principals from 2 provinces, one rural, the other urban, as well as 8 curriculum officers. Both qualitative and quantitative data were obtained from the respondents; and they were analyzed descriptively using measures of central tendency. Basically, the findings established that the curriculum contents were imbalanced vertically and horizontally, and that there was a mismatch between the teaching procedures and techniques and the official approaches. It was further found that the government had not lived up to its promises of a systematic and adequate in-service training for the teachers. The recommendations were essentially geared towards an improvement of the curriculum, based on the study findings, and the need for an empowerment of teachers and curriculum designers so that they can better accomplish their interlinked duties of teaching, assessing, monitoring, and counseling.

Introduction

Burundi's formal adhesion to the East African Community (EAC) in 2005 has necessitated a boosting of the teaching of English in the country to respond to the Community's requirements with regard to its business languages. Article 137 of the Community's Treaty indeed establishes English and Kiswahili as its official languages. Yet neither of the two is developed to this extent in the country.

Burundi has traditionally relied on French – even though it was not colonized by France – for administrative and official purposes, leaving English with the status of an academic subject. Kirundi, the only mother tongue to every citizen, alternates with French as official language when the circumstances involve Burundians primarily. Until 2005, Kiswahili was a language generally limited to trade.

Therefore in consequence, a review of the education system was operated, and English and Kiswahili were introduced in primary education, in a move to facilitate the process of regional integration. So far, English was taught as a foreign language (EFL) from secondary education upwards. Informally, some private initiatives were increasingly being created to cater for the rising needs for English both in the private sector and in higher education.

Statement of the Problem

English language teaching (ELT) in primary education was welcomed in the country as a sound initiative. The measure to proceed immediately with programme implementation, however, despite the curriculum not having been piloted, and even as the teachers had not been consulted for their readiness, was regarded as a big flaw in the initiative. This further happened notwithstanding the teachers' lack of any pre-service preparation for teaching English (or Kiswahili), a situation denounced by Teachers' Unions, but which did not succeed in stopping the then new government from launching the programmes. The argument to counter a certain opinion that the measure was being "hastily" executed (Mivuba, 2009b, p. 5; Rwantabagu, 2010b, p.5) rested with promises to facilitate teaching through the provision of in-service training (INSET) to teachers.

Whereas the government, through the Ministry of Education (MoE) showed strong enthusiasm for launch of the courses, their implementation has, however, not been accompanied by similar efforts. In particular, very little or no interest has been shown for the curricula and their application, in spite of their being considered an important innovation in the education system and in ELT in Burundi. As implementation has been taking its course, the government has not taken relevant steps to appraise both the process and the materials/instruments it is using.

Purpose of the Study

Conscious of the need for the government to be constantly informed on the quality of the education being provided, the researcher, through this study, set out to assess the adequacy of the curriculum contents and the efficiency of the support services provided to facilitate the programmes implementation at each level of the state primary schools.

Objectives of the Study

The objectives of the study were:

1. To analyze the course books used to teach English in state primary schools
2. To examine the methods and resources suggested in teaching English
3. To establish the efficiency of support for programme implementation
4. To establish the challenges faced in teaching English at the primary level

Research Questions

The study was guided by the following questions:

1. What are the goals of the primary English curriculum?
2. What resources and methods are recommended to carry out its goals?
3. What is the efficiency of the support for implementing the programme?
4. What are the needs and challenges faced by the implementers?

Review of Related Literature

The review of related literature was done taking into account the pre-service background and professional needs of the teachers in Burundi, more particularly the needs in the TEFL angle of ELT. In this light, the following themes were judged worth exploring for the awareness that they embody, and its potential in discussing the underpinnings of the thesis' objectives. These themes included: the processes of curriculum/syllabus development and evaluation/appraisal; the goal of an EFL curriculum; influential theories and methods in TEFL and their relative pedagogic contributions; a functional approach to goal/objective setting, structure teaching, and skill development; and the contribution of teacher-appraisal to the teachers' professional development.

Both curriculum and syllabus are important instruments in the lives of practicing teachers; yet not all teachers are always aware of their role as instruments that can and should guide decisions about their teaching. But even before making their decisions, teachers need to have the ambiguities and overlaps around the concepts lifted. Such is for example, found in Nunan (2001) and Ayot (1984). Sometimes, too, their interchangeability is acknowledged, as can be illustrated in Ahmad (2013) and Ross, Evison, and Robertson (1972).

Probably a practical understanding of the two concepts is one guided by their hierarchical relationship in which curriculum, as a provider of the particular programme goals and methodological orientations, is perceived as offering a framework on which syllabus design will draw for the selection of language contents and methodological procedures/techniques. This, in essence, is its concern.

For the same purpose of confidence-building, teachers, especially new and less qualified ones, need to be guided towards forming appropriate attitude to their textbook so that it serves the right needs of the programme as well as those of their learners. This is necessary in the sense that the textbook is basically the outlet for curriculum and syllabus, and probably the only document in their own and learners' possession. Crookes and Chaudron (2001, p.30) offer a comprehensive orientation in this regard: "For the untrained teacher, a good textbook can stand in for a syllabus and a training programme … an experienced teacher … an aid, adopting … adapting some parts …"

> Teachers' perspectives will further open up if they have knowledge (or seek understanding) of the educational value of the book in their hands. If they participated in its selection (which is not the case in Burundi so far), such knowledge will for the most have been established; but there will still be the need, or responsibility, to decide how best to use what it offers as contents supposed to yield successful teaching. This means that the analysis of the contents in the textbook will be done with a view to examining how they can be used to attend to the achievement of the goals intended for the programme (Byrd, 2001).

The other point being made then is that the teacher must seek to know the goals of the programme –they may be found in the curriculum statement (if there is one), or else at least in his/her textbook. This is where textbook appraisal or its analysis for implementation (Byrd, 2001; Prodromou, 1994) comes in handy. Its broad purpose is the deliberate effort to understand the strengths and weaknesses of one's textbook so as to determine *how* to use it. With this understanding in mind, appraisal distinguishes itself from evaluation which is concerned with dichotomic decisions to select and/or use the particular book, or reject it (Mattingly, 2012).

An awareness of the language learning theories and teaching methods that influence TEFL in its contemporary realizations is not just helpful in the analysis of curriculum; it is another essential factor in teacher development because it offers useful foundations for the insights that teachers need to determine which approaches and practices may best cater for the complex needs found in their various situations and classes. For example, a teacher with a clear grasp of the limitations of audiolingualism (Larsen-Freeman, 2012; Champeau de Lopez, 1994) will know when, why, where and how to restrict choral repetitions or loud reading in the learning process.

Assuming that the teacher's awareness in the above scenario integrates knowledge of the major principles underlying communicative language teaching (Savignon, 2001), he/she will be in a position to use the same informed mind to direct his/her teaching towards engaging his/her learners in meaningful use of the language. This is seen as involving realistic practice of both speaking and writing – in the form of a continuum which gradually, but steadily, leads to learner self-expression (Harmer, 1983; Fotos, 2001). Such viewing of practice is critical to the development of communicative proficiency, particularly in EFL settings where class time is so valuable to learner exposure to English (Celce-Murcia, 2001;; Ediger, 2001). It may require of the teacher some flexibility and creativity, and a sense of self-reliance which only broad awareness supported by continual enhancement and upgrading in TEFL can generate.

Having said that, it may be worth pointing out the pressure exercised on the 'alert' teacher by the competition of instructional methods and materials in the ELT field. This pressure, while it is normal in most teachers' routines, is here exacerbated by responsibility (sometimes it is self-imposed) to scale up and down a range of contents (for example: presentation materials, learning activities, exercises/tasks) trying to suit the various needs dictated by administration, the learners, or the teacher's own style (Crookes and Chaudron, 2001). Such pressure notably underlies the use of 'principled' eclecticism (Larsen-Freeman, 2012), a teaching approach, which in the absence of a one-size-fits-all 'perfect' method, is seen as probably most efficient in addressing the complexities of learning environments and learner variables in a changing world (Celce-Murcia, 2001).

The continuing shifts in the learning purposes for English – themselves deriving from the changing status of English to become an international language – are seen as the major driving force behind dynamic research in TEFL/TESL. Larsen-Freeman (2012), talking about the evolution of English into a world language, explains that this has been 'fuelled' by growing population mobility around the globe. The social implication has been the creation of more contacts and interactions among people from all walks of life and both ESL and EFL. The general implication for EFL has been that learning purposes have gradually shifted from being purely pedagogic (scientific-oriented) to becoming utilitarian/functional (Larsen-Freeman, 2012; Celce-Murcia, 2001).

That EFL has increasingly become a more meaningful practice for different communities of learners cannot be denied. It is in this connection that the president of Burundi, for example, in an address to the local community (2009) invited Burundians to "undertake active learning of English (and Kiswahili)", emphasizing the potential job opportunities that proficiency in these two languages were bearing for them within EAC member states. In this perspective, there is reason to believe that Burundians, as learners of EFL, are most probably being driven by the same kind of aspirations as their counterparts in ESL settings; hence the possibility of parallels in the provisions to be made for learners in both ESL and EFL settings (Savignon, 2001).

In this light, it appears that the general wish underlying current curricular innovations in EFL – and thus the aim – is to have programmes of study geared toward equipping learners with competencies that should enable them to become competitive in a more globalised world. This suggests integrating needs assessment as the starting point in syllabus design (Nunan, 2001) and above all, a shift of focus from mastery of the language system – probably for examination-related purposes – to teaching oriented toward achieving the goal of developing the learners' communicative competence. This, for example, imposes itself in Burundi as a relevant improvement able to innovate ELT in the country.

Further integration is necessary, as part of the vision on ELT, of three functions increasingly assigned to today's EFL curriculum, namely: to provide learners (and teachers) with a clear rationale for learning English; to impart in them the language knowledge (grammar, vocabulary, functions) and skills necessary to understand and express themselves reasonably in English, and above all to allow for substantial output which prepares learners for the kinds of real life encounters they may have with English.

For the sake of realism, though, recognition must be made of the role played by financial constraints in restricting the teachers' achievements of reasonable levels of professional development, just like in the feasibility or application of certain otherwise desirable practices such as interactive techniques, audio or video-supported learning. with all that this entails in terms of quality of learning – since that of the materials will not have been spared either, for the same reason. Equally, while it holds that "In all professions, in all walks of life, there needs to be a constant upgrading and updating of knowledge and skill" (Goddard & Emerson, 1995, p.11), there has been complicated implementation of the same principle when it comes to teachers, especially in the primary level.

Evidence of this apprehension in Burundi comes from the experiences of the English curriculum for Burundi state primary schools (ECFBSPS) for both the reasons given in the introduction to this paper, and considering that after almost 10 years of implementation of the English curriculum, there are those for whom the question has changed from *when* to *whether* their opportunity for INSET will ever come. This calls into question not only the promises made for INSET, but also the confidence placed in teacher appraisal (TA) as a mechanism to compensate for some gaps in the teacher's professional training itself.

The risk of an illusion is great if and where those in charge (the school principals, curriculum designers, the inspectors, and perhaps teachers of good will) are themselves not equipped with the relevant knowledge and skills to carry out duties of supervision and monitoring in a manner that would offer genuine assistance to the teachers in need. This will be even worse if they are not supported to construct sufficient mastery of the innovations that they are called to implement. For example, 'critical observation' is both an attitude and a skill that cannot be improvised (Goddard & Emerson, 1995). Murdoch (1994) and Barnard (1995), on their part warn against practice of TA which emphasizes the teacher's weaknesses, a characteristic of the less appreciated Accountability TA Model (Goddard & Emerson, 1995), still prevailing in Burundi.

In the same vein, peer-appraisal, as an alternative option worth introducing in TA in Burundi, may sound pointless for instance, in the case of the ECFBSPS. However, the apprehension that teachers have nothing to offer because of their weak preparation background does not necessarily argue against Gebhard's (1994, p. 34) point that "One way how teachers can gain awareness of their teaching is to observe other teachers do it, and … to construct and reconstruct their own knowledge". Regardless of the parties' competence or experience, TA remains in the interest of educational training; and both teaching failures and successes are bearers of worthy lessons.

Murdoch (1994) further scrutinizes the all too often Normal Model of teacher-training for its pursuit of the trainer's agenda instead of the trainee-teachers' needs. The major argument is that its promotion of the 'passive' role of the trainees is likely to result in the teachers reproducing the teaching approach that was used for their teaching experience, and with it, its weaknesses. A subsequent comparison with the Trainee-Centered In-service Training Model (Murdoch, 1994) concludes that by offering the trainees opportunities to confront their previous experiences and knowledge with the novel ideas/techniques in mutually supportive environments, the latter model was poised to be more successful in striking a good balance between theory and 'hands-on' practice. This combination, if well reasoned, is not only essential, but it is also able to stimulate the kind of sharing that the trainees need to engage in, and which should facilitate their understanding of the desired changes in professional behaviour.

Magoma (2010), Matere (2011), and Omollo (1991) carried out researches on the *Integrated English Curriculum* (IEC) in Kenya which are able to inform on the shortcomings of an innovation that does not fully integrate adequate and systematic preparation of the implementers. They came out with findings which stand in for potential parallelisms with the case of the ECFBSPS. According to Magoma, poor clarity of the concept (integration) was resulting in low levels of integration of language and literature. A weakness reported as directly linked with sponsorship was poor mastery of the concept by some among the trainers themselves. Omollo noticed persistent 'mishandling' of integration in the classes observed, which was coupled with lack of appropriate resources to support the integration. Matere found that teachers in the lessons observed were low on strategies of integration owing to poor command over the concept coupled with lack of resources to cope with implementation demands, a situation which frustrated heads of departments committed to assist in the implementation. An important feature to report about the IEC was that it had been preceded by needs assessment, a process that was repeated before Magoma's and Matere's researches.

Methodology of the Study

The research was done using a descriptive survey and exploratory design. The kind of information sought was in the form of opinions, perceptions, and practices, all obtained through experience survey (Kothari, 2004; Creswell, 2012) which involved teachers of English in state primary schools, their principals, curriculum officers for this level, and the pupils – but at a lesser degree. This information was complemented by an analysis of the official course books for this level. Thus in order to achieve the study objectives, 4 types of instruments were used which comprised a questionnaire for each category of implementers, a classroom observation checklist, and a content analysis guide. The population sample included 20% of the teacher and principal populations in two provinces, namely Mwaro which is rural, and Bujumbura Municipality (Buj. M) which is urban. Concretely, the distribution of the population samples was as indicated in Table 1 below. Out of the total population of 9 curriculum designers, 8 (88.8%) were involved in the investigation, while 1 was used in piloting. All 6 textbooks (and their accompanying Teacher's Books (TB) that cover the primary level were content-analyzed. 6 out of the 10 observed classes were from Buj. M; the remaining 4 from Mwaro. The choice for these 2 levels was dictated by the fact of reading and writing being taught here.

Table 1: Research Population Sampling Grid

Target population (100%)	Sample size (20%)
Buj. M - Teachers: 882 - Principals: 239	 177 47
Mwaro - Teachers: 920 - Principals: 110	 194 33

Although classroom observation was originally planned to be held in 5th and 6th Grades, a change in the academic calendar for 6th Grade led to an abandonment of this class, because it was no longer available for observation. The major components targeted in each research instrument are outlined in Table 2 below.

Table 2: Summary of the Instruments' Components

Instrument	Component targeted in the study
Teacher's questionnaire	-INSET achievements -Learning activities/exercises & official methods
Principal's questionnaire	-Supervision-related gains from INSET -Improvements observed in trained teachers' performance -Practices and perceptions of teacher appraisal (TA)
Designer's questionnaire	- INSET achievements through teacher performance -Appreciation of specific curriculum contents -Practices of TA -Attitude to lack of curriculum statement & syllabus document
Classroom observation checklist	-Ability to implement the curriculum methods -Ability to communicate in English during instruction
Content analysis guide	-The curriculum goals -The learning resources (coverage, variety, suitability, interest, relevance …) -Instructional support (guidance, illustrations) -Assessment guidelines

It follows that the instruments were designed to crosscheck one another in relevant components, such as with regard to the achievements of INSET and the assessment of curriculum contents. The classroom checklist was distributed over 4 information rubrics: flexibility in using English, teacher language model, supply of practice opportunities, and other (emerging) aspects of methodology, for example error correction. The support from curriculum designers and school principals was estimated necessary for understanding the needs and challenges around the ECFBSPS. All three questionnaires had an extra component which was common, and in which respondents were invited to make suggestions for improving the English curriculum implementation.

The data obtained was quantitative and qualitative in nature. The former derived from the open-ended items in the questionnaires, while the latter resulted from the open-ended questions, the content analysis, and the classroom observation. The analysis was done descriptively, using measures of central tendency (mean, frequency percentages enhanced with graphic representation).

Major Findings

Within the INSET angle, the research established the co-existence of trained and untrained teachers and principals in the schools and differences in the volume and length of INSET, as well as in the INSET deliverers. Some sessions were run by designers; others by secondary school teachers, or both. Table 3 summarizes key features of these findings, in which Mwaro comes out as counting more untrained teachers and principals than Bujumbura.

Table 3: Summary of Learning Opportunities

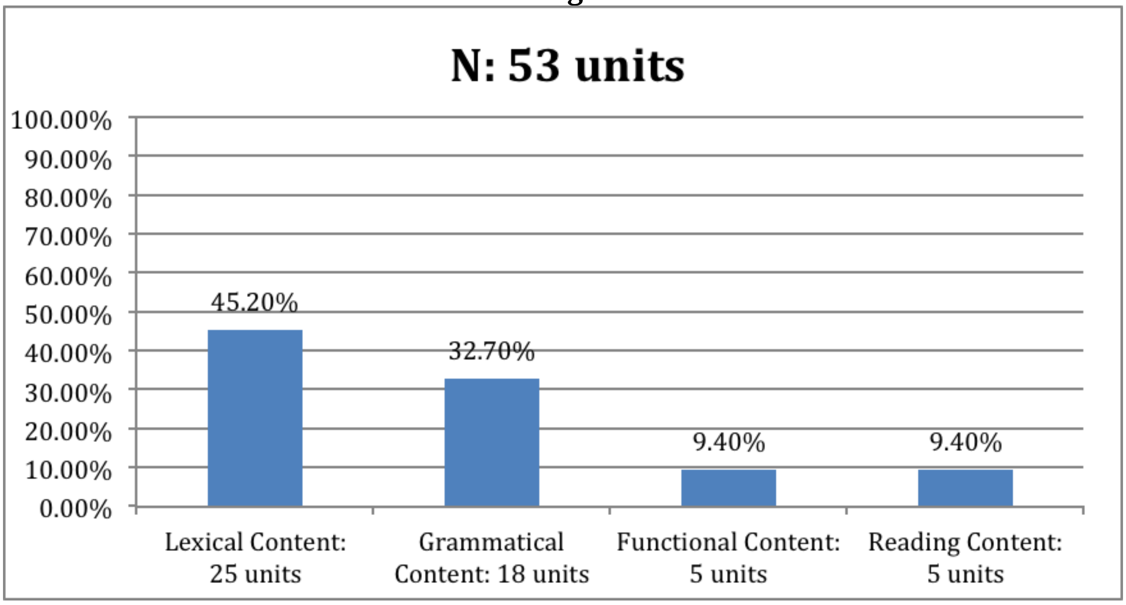
Training	Buj. M frequency	Mwaro frequency
Trained teachers	135 (81.3%) - 1 INSET: 119 (88.1%) - 2 INSETs: 13 (9.6%) - 3 INSETs: 3 (2.2%)	86 (63.2%) - 74 (84.0%) - 11 (12.7%) - 1 (1.1%)
Untrained teachers	31 (18.6%)	50 (36.7%)
Trained principals	31 (65.9%) - 1-2 days: 2 - 3-4 days: 6 - 1 week: 17 - 2 weeks: 4	17 (53.1%) - 3 - 3 - 6 - 3
Untrained principals	16 (34.0%)	15 (46.8%)

It was also learned that INSET was focused on the components of *methodology* – or rather execution of the given procedures given in the TBs – and *pronunciation*, which targeted key words in the texts (and how this would be transferred to pupils), a finding which was corroborated by designers, as INSET organizers. Together, these findings led to the conclusion that INSET was neither systematic in its coverage nor adequate in its input..

Further in connection with these 2 components it was found that the ratings for satisfaction with its achievements remained below 50% with regard to *methodology* (44.6% in Buj. M and 45.3 % in Mwaro), and that they roughly fell to 38.5% - 45.3% in relation to *pronunciation* and the overall evaluation of the programme relevance. When asked how they found the methods, the teachers however reported that it was ‘easy’, with ratings of between 72.0%-74.0%). This perception was corroborated by content analysis whereby it was established that all that teachers have to do – if they teach prescriptively – is give the meanings of the target forms and model their pronunciation for the pupils to repeat, a process which is not cognitively challenging, to say the least.

Within the curriculum contents angle, there was apparent harmony over the findings establishing poor coverage of learning activities – not to mention exercises – and their narrowness in scope. Figure 1 illustrates some of the imbalance in the learning contents, with the *functions* component being most neglected. Although it equals *reading* in space (9.4% for each), it will be recalled that reading is not taught until the end of Grade 4. The views were, however, split over their *interest* and *suitability* that were highly rated by the teachers and appreciated by the designers, but not confirmed by either content analysis or classroom observation (roughly between 62.5%-64.4% for *interest* and 64.5% in Buj. M (against 35.2% in Mwaro). That lexical content is largest in volume can be understood to the extent that learners at this elementary level are still building up basic vocabulary. The law, though, is that they are taught/learnt passively, which is likely to perpetuate the ‘rote learning’ approaches that the latest reform in higher education (2010) was partly set out to change (Mivuba, 2009a; Rwantabagu, 2010a).

Figure 4.1



Concerning the teacher performance component, classroom observation established that teachers were overly dependent on their TB both for the lesson content, procedures, and the instructional language; and that English was generally avoided in favour of Kirundi and French combined. It was further noted that teachers had enormous difficulties with pronunciation and structure, and that learning was still solely based on and limited to the prescribed pronunciation drills and loud reading. Error correction was additionally found to take a large share of the teaching time.

Finally within the TA angle, the practice unanimously reported by all 3 populations of respondents was classroom visits with the clarification from principals that the visit was planned and followed by an exchange. Also, it emerged that although the suggestion to introduce peer-appraisal was generally positively welcomed by teachers and principals, it was perceived as an intrusion into managerial duties by some principals. The perception of its success was considered to be suspended to the training of teachers.

Recommendations

Principally, the study has recommended to reappraise the English curriculum with a view to clearly spelling out the goals assigned to ELT in primary school, balancing the contents vertically and horizontally while also aligning the teaching procedures and techniques to the communicative and learner-centered approaches, which were the ones formally advocated for the curriculum.

In connection with INSET, the recommendation has been to rethink its planning and input in a manner to allow each teacher and every principal adequate training and which cares to clarify for them and in the course books both the organization of learning and methodological principles of the communicative approach.

Both teachers and designers were invited to engage in the search for additional knowledge enhancement opportunities so that they would benefit better understanding of aspects of their duties which may not be adequately provided for through pre-service and in-service training, for example through use of the university of Burundi's library. In effort to improve their speaking proficiency, self-initiated opportunities in which teachers can practice the speaking skills were recommended as well. One such opportunity could be the creation of school or canton-based English clubs for teachers.

References

Ahmad, D. (2013). EFL *materials: Their types, Roles , And functions in ET/L process* Retrieved from www.eslbase.com/articles/creating materials

Ayot, H. O.(ed.) (1984). *Language for learning and teaching*. Nairobi, Kenya: Macmillan Kenya

Byrd, P. (2001). Textbooks: Evaluation for selection and analysis for implementation. In Celce-Murcia, M. (ed.).*Teaching English as second or foreign language* (3rd ed.) (pp.414-428). Boston, USA: Heinle & Heinle

Celce-Murcia (2001). Language teaching approaches: An overview. In M. Celce-Murcia, ed., *Teaching English as second or foreign language* (3rd ed.) (pp.414-428). Boston, USA: Heinle & Heinle

Creswell, J. D. (2012). Educational research planning: Conducting and evaluating quantitative research (4th ed.), *Teaching English as second or foreign language* (4th ed..) Boston, USA: Pearson

Crookes, G. and Chaudronn, C. (2001). Guidelines for classroom instruction. In M. Cellce-Murcia (ed.). *Teaching English as second or foreign language* (3rd ed.) (pp.28 – 42). Boston, USA: Heinle & Heinle

Ediger, A. (2001). Teaching children literacy skills in a second language: In M. Celce-Murcia (ed.). *Teaching English as second or foreign language* (3rd ed.) (pp.153 – 128). Boston, USA: Heinle & Heinle

Goddard, I. and Emerson, C. (1992) *Appraisal and your school*. Oxford, U:K:: Heinemann.

Gebhard, J. G. (1994). Awareness of teaching: approaches, benefits, tasks. In T. Kral (ed.) (pp.34-47). *Teacher development: making the right Move*. Washington: USIA

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Delhi, India: new Age.

Larsen-Freeman, D. (2012). From unity to diversity: Twenty-five years of language-teaching methodology. *English Teaching Forum*, 50(2), 28– 37.

Magoma, C. M. (2011). *Curriculum innovation in Kenya. Acase of the introduction and implementation of secondary school integrated English in Nairobi county* (Unpublished Doctoral Dissertation). Nairobi, Kenya: Kenyatta University.

Matere (2011). *Strategies used in the teaching of the integrated English Course in selected secondary school integrated English in selected schools of Bungoma West District, Kenya* (Unpublished Doctoral Dissertation). Nairobi, Kenya: Kenyatta University.

Mattingly, D. (2002). Evaluating evaluation: The case of parents' involvement programmes. *American Research Journal*, 48,549-576.

Mazunya, M. and Habonimana, A. (2010). Les langues d scolarisation dans l' enseignement fondamenal en Afrique sub-saharienne francophone: réalisation d' etudes bibliographiques et d' enquête de terrain. In MAFE et al. *Les langues de scolarisation en Afrique francophone : Enjeux et repères pour l' action* (pp.94– 147). Paris, France : Edition des archives contemporaines.

Mivuba, H. (2009a). *Impact de la langue d' enseignement sur les résultats d'apprentissage dans les écoles primaires du Burundi*. Bujumbura, Burundi : Action Aid.

Murdoch, G. S. (1994) A trainee-centered approach to in-service training. In T. Kral (ed.). *Teacher development: Making the right moves* (pp. 48–56). Washington DC, USA: USIA.

Nunan, D. (2001). Syllabus design. In M. Celce-Murcia (ed.). *Teaching English as second or foreign language* (3rd ed.) (pp.55 – 65). Boston, USA: Heinle & Heinle

Omollo, D. R. (1990.*An investigation into the techniques and problems in integrating the teaching of English and literature in English in secondary schools within Kisumu* District (Unpublished Doctoral Dissertation). Nairobi, Kenya: Kenyatta University.

Prodromou, L. (1994). The good language teacher. In T. kral (ed.) (18-33).*Teacher development: Making the right move*. Washington: USIA

Rea, P. M. (1983). Evaluation of educational projects with reference to foreign language education. In C: J. Brumfit (ed.). *Language teaching projects for the third world* (pp. 85– 99). Oxford, U.K.: pergamon.

Ross,J. M. et al (1972). *A critical appraisal of comprehensive education*. Mersyside, U.K.: NFER.

Rwantabagu, H (2010a).*Teacher education in Burundi : Progress and challenges*. Bujumbura, Burundi: University of Burundi.

Savignon, S. (2001). Communicative language teaching for the twenty-first century. In M. Celce-Murcia (ed.). *Teaching English as second or foreign language* (3rd ed.) (pp.13–28). Boston, USA: Heinle & Heinle

PERCEPTION OF TEACHING AS A PROFESSION AND UB TEACHER TRAINEES' ATTITUDE TOWARDS TRAINING PROGRAMME AND TEACHING

H. J. Nenty
University of Botswana
hjnenty@yahoo.com

Sello Moyo
University of Botswana
sellmoyo@gmail.com

Fiji Phuti
University of Botswana
sithabilephuti@gmail.com

Though the professionalism of teaching is still a debatable issue, teaching provides an indispensible service to every society and civilization. The service provided by teaching seems to be more indispensible to any society than services provided by any other profession. To those that teach, the way they perceive themselves and the value of their service tend to make a lot of difference. The study looked at the influence that such perception by teacher trainees in UB has on their attitude towards their training programme (TTP) as well as towards teaching generally. A statistical analysis of data from a quantitative survey of 68 UB teacher trainees with a 54 closed-ended validated Likert-type items showed that in the perception of UB teacher trainees, teaching is a profession and this view is significantly stronger among female than males teacher trainees. Their level of perception of teaching as a profession has significant influence on their motivation to do well in their teacher training programme (TTP); attitude towards their teacher training programme (AtTTP), the value they attached to the programme (VaTTP); and their perception of the effectiveness of the programme (ETTP). Similarly, the level to which they perceived teaching as a profession has a significantly positive influence on their willingness to teach WtT); attitude toward teaching (AtT) and the level to which they perceive teaching as a stereotypes career (STC). Generally, the higher their perception of teaching as a profession, the higher their attitude towards their TTP as well as towards teaching in general. The findings were discussed, implications drawn and recommendations made.

Key words: Professionalism of Education; Teacher Training; Attitude towards Teaching, University of Botswana (UB), Botswana

Introduction and Background

Teaching provides an indispensible service to every society and civilization. The service provided by teaching seems to be more indispensible to any society than services provided by any other profession. In many respect the teaching profession is a nation builder and sometimes it is referred as the mother of all professions. It is given such accolade through its ability to produce well rounded individuals who will in turn promote best practices, unlock many doors for our prosperity and attract much needed for international investment and expertise. The Botswana Government also recognizes this in the white paper (1994).

> The success of any education system depends largely on teachers. They are the catalyst of the learning process and on them mainly rests the whole system. They are therefore crucial in the strategy to achieve a more effective and responsive education system. (p. 4)

Teaching has been dubbed the mother of all professions and history has confirmed this over the centuries. In Botswana in particular, teaching was the main profession at independence in 1966, no wonder the Botswana Cabinet then consisted largely of teachers. Overtime however, varying professions nurtured by teaching proliferated, organized themselves, and bargained for superior conditions (Tau, 2014). As a result of the modesty of teachers and the otherwise sluggish response to the referred developments, the teaching profession has arguably lost the respect, reverence and dignity it was associated with in the earlier years. More often, the public hardly talk of any well-defined and widely accepted ethics of the teaching profession that would have otherwise galvanized the teachers. Consequently teachers have lost grip on the struggle to determine their destiny. According to the British Department of Education (2010).

> The first, and most important, lesson is that no education system can be better than the quality of its teachers. The most successful countries, from the Far East to Scandinavia, are those where teaching has the highest status as a profession; South Korea recruits from their top 5 per cent of graduates and Finland from the top 10 per cent. (p. 3)

Theoretical Foundation

Professionalism and Attitude towards Teaching

Professionals including teaching fraternity need to be equipped with the knowledge, skills, and attitudes needed to enhance society learning in this constantly changing environment. According to Desimone (2009) professionals in teaching, as a sum, should evolve over research which lead to a more thorough understanding of the factors that contribute to effective teacher professional development and effective education, like: (a) research on teachers' knowledge of, skills in, and attitudes towards formal and informal collaborative, inquiry based, and contextualized education; (b) Development and evaluation of programs, interventions, and tools that foster collaborative, inquiry based, and contextualized learning, with a specific focus on teacher performance and the effects of this performance on students' learning. Thus, in order to stimulate and assess effective professional development (in terms of knowledge, skills, and attitudes) and its impact on for instance, students' knowledge acquisition, creative or inquiry thinking, or attitudes and motivations, these concepts first need to be well defined and elaborated on (ELAN, 2014).

Teaching is regarded as a profession among the factors is autonomous and trust. That is it is an autonomous profession because it is concerned with the effects of central control on teachers professionalism. The second factor, teaching as a trusted profession as it combines statements about trust, integrity, and the desirability of having an influential and independent professional body for all teachers, with those teachers evaluating their work, using their professional judgment and directing other staff in the classroom (Hargreaves et al., 2006).

Teachers' professional knowledge and actual practices may differ not only among countries but also among teachers within a country. To gain an understanding of the prevalence of certain beliefs and practices it is therefore important to examine how they relate to the characteristics of teachers and classrooms. It is even more relevant to look at the impact on teachers' beliefs, practices and attitudes of professional background factors such as type of training, certification and professional development, subject taught, employment status (part-time versus full-time) and length of tenure. It is important to note that any of these relationships can have different causal interpretations (OECD, 2009).

Explicitly, true contribution to the advancement of theory and practice of teacher professional development, is better guided by combination of different parts (a) how do professionals learn, what constitutes teachers' attitudes towards education or inquiry learning); (b) The development, implementation, and evaluation of new interventions (e.g., which interventions, methods, or tools have the desired effects on both teachers and learners); (c) The development and validation of a variety of measurement instruments and methods that assess pedagogical content knowledge, skills, and attitudes of both teachers and students (ELAN, 2014).

The Problem and Purpose of the Study

To those who teach, the way they perceive themselves and the value of their services tend to limit their efficiency and hence productivity. Such perception is influenced by the views of the public about teaching. A teacher tends to be psychologically handicapped by public perception of the value of his/her service. According to Nenty (2010) pressure emanating from negative views from the public of teaching as a career by the society tends to reduce the amount of affective and cognitive investments on teaching and learning by teachers and teacher trainees. Such views tend to kill the aspiration and inspiration stamina of teachers. A situational analysis of Botswana education system has noted that there is a challenge of poor quality teachers, as practicing teachers do not get equitable treatment when it comes to teacher training and professional development (Kgalemang, 2015). The situation needs urgent attention. The report indicates that the issue is compounded by inadequate provision of teacher training related to the new curriculum resulting in teachers often not being in a good position to implement the curriculum properly. This is an immense challenge that reflects that teaching profession in Botswana within the context of the teacher developments. As an attempt to address the challenge, it is important to investigate into teaching as a profession as perceived by teacher trainees.

Taking the account the problem identified, this study ought to determine the extent to which, in the perception of UB education student deem teaching as a Profession and their influence towards teaching.

Research Questions and Hypotheses

1. To what extent do the UB teacher trainees perceive teaching as a profession?
2. To what extent do UB teacher trainees' perception of teaching as a profession influences their attitude towards their training programme and teaching?
3. To answer these research questions, the following null hypothesis were tested:
4. UB teacher trainees do not significantly perceive teaching to be a profession.
5. There is no significant gender influence in the level to which teachers perceived teaching as a profession.
6. The level to which teacher trainees' perceive teaching as a profession does not significantly influence their:
    i. Motivation to achieve in teacher training programme.
    ii. Attitude towards teacher training programme.
    iii. Value for their teacher-training programme.
    iv. Perception of the effectiveness of the teacher training programme
    v. Their willingness to teach.
    vi. Attitude towards teaching.
    vii. The level to which they perceive teaching as a stereotyped career.

Review of Literature

Teaching as a profession has been studied at different perspective. Hargreaves et al., (2006) studied the teachers, trainee teachers and other associated groups who responded to the questionnaires on the teacher status which had a number of special features, including the range of perspectives on status that it has investigated, and the way in which it has attempted to find a definition of high professional status, and used that to examine perceptions of the status of the teaching profession. It showed that there are still large differences between the teaching profession and those professions judged to have high status in terms of reward and respect and as control and regulation. Teachers, trainee teachers and associated groups see the teaching profession as virtually on a par with a high status profession in terms of the training, responsibility and performance that teaching requires.

Peter and Peter (2011) carried an interview-based qualitative study in Malawi concerning with the recruitment of secondary teachers. The study revealed a range of perspectives for pursuing a teacher training course: failure to follow a desired career, springboard to other careers, to upgrade, and teaching out of vocation. It also showed that trainee teachers held a range of images about teaching: its ability to enhance knowledge; low pay with no incentives, low status profession, and lack of trust of male trainee teachers. They then made some recommendation among is that teacher educators and policy makers need to consider the perspectives of trainer teachers to reduce resource wastage and support trainee teachers appropriately.

Babu and Raju (2013) conducted a study to examine the attitude of student teachers towards their profession. The study was conducted on a sample of 437 student teachers studying in 7 colleges of education in Vizianagaram district (India) among them 239 were males and 198 females and methodology wise 143 were in mathematics, 48 physical sciences, 134 biological sciences and 112 social studies subject student teachers. They were administered self-constructed tool (teachers attitude) developed by the investigators. The tool consisting of 60 items with 7 areas viz. professional problems, teachers pay scales, vacancies and other privileges, nature of work and workload, teachers interest towards pupils, teachers attitude towards management and professional status of teachers.

The collected data were analysed for the mean and standard deviations, and t-test analysis was done to tests various hypotheses. Significant gender differences as well as differences across subjects were observed. Male and female student teachers were differed significantly in attitude towards the teaching profession. Male and female student teachers were differed significantly in the areas of professional problems, teachers' pay scales, vacations and other privileges, teachers' interest towards pupils, teachers' attitude towards management and professional status of teachers in their attitude towards the teaching profession. Student teachers belong to different subjects differed significantly in their attitude towards teaching (Babu & Raju, 2013).

In another study focused on the views of the 58 teacher trainees who have recently started the teaching profession on teacher training process. The purpose of the study is to evaluate the views of the teacher trainees on the process of teacher training in Turkey. The findings of the study revealed that the teacher trainees felt insufficient especially related to curriculum and content knowledge and that teaching practice and school experience courses do not adequately contribute to their profession (Oguz, Unal, Murat, Duran, Lutfi & Ergun, 2013).

In another study, Marina-Stefania, Andrew and Angi (2011) dealt with path analysis study using data from a longitudinal study investigating the experiences of trainee and early career phase teachers in England. The data were generated via self-complete questionnaires and follow-up telephone interviews with 1,322 trainees. Those on undergraduate or school-based programmes felt better prepared to work as teachers than one-year postgraduate trainees, perhaps because the former give higher ratings of the quality of assessment of, and feedback received on, teaching practice, and because of the clarity of theory-practice links in programmes.

Across different kinds of initial teacher preparation (ITP) programme revealed a good relationships with school-based mentors significantly boosted trainees' confidence that their ITP had effectively prepared them for teaching. Trainees' motives for entering the profession and their initial concerns about and expectations of ITP also affected their perceptions of its effectiveness, by shaping the way they experienced aspects of their courses. Implications of these findings for policy and practice in teacher preparation are discussed (Marina-Stefania, Andrew & Angi (2011).

Sahayarani and Stanly (2014) study aimed at identify the attitude towards teaching profession of B.Ed trainees and difference between the sub-samples of the students in respect of their attitude towards teaching profession. The investigators have randomly selected 104 students from four different colleges of education in Pondicherry as sample. Results revealed significant different in attitude towards teaching profession in the sub-categories sex, subject and locality. They concluded that the attitudinal change towards teaching should be the focus point in the teacher training programmes.

Methodology

This is a survey inferential study in design conducted to capture and analysed the perceptions of University of Botswana, education students regarding teaching as a profession. Data were randomly collected from total of 73 education students toward the end of second semester 2014/2015. Out of the sampled 73 students, 38 were Post graduate Diploma in Education (PGDE) and while 34 were Bachelor of Education students. One participant failed to indicate his/her academic status. Among them were 57 females and 16 males without specified sampling frame.

The questionnaire was used to collect data. It is consisted of two parts. The first part- Part I had five items demanded for the demographic information of students. Part II with 53 Likert-type items with six options – from 'very strongly agree' through 'very strongly disagree' – was developed. Additional two items were included to demand students to state his or her overall grade in the last semester and the expected grade at the end of the next semester. Face-validated of items was by three colleagues in the area of assessment. Thus looked into every item to find out whether they were measuring what it supposed to measure in relation to the operationalized indicators of students perception to teaching as a professional. Negatively worded items were scored in the reverse direction. A Cronbach alpha analysis of the reliability of the measurement of the variables involved in the study showed that for motivation to achieve in teacher training programme with 3 items, alpha was .408; attitude toward teacher training programme with 10 items, alpha was .869; value of teacher training programme with 6 items, alpha was .501; willingness to teach with 13 items, alpha was .718; attitude towards teaching with 4 items, alpha was .589 and effectiveness of the training programme with 5 items, alpha was .603. These are acceptable reliable coefficients that indicate that the instrument is reliable hence it can be used to collect data.

Analysis of Data and Interpretation of the Results

The data collected for each hypothesis were analyzed using the statistical Package of the Social Science (SPSS) version 21. The first null hypothesis, dealt with the perception of students' teacher towards professionalism that was UB teacher trainees do not significantly perceives teaching to be a profession. In an attempt of answering this null hypothesis a one sample t-test was done. That is comparison between a single mean of the sample with the sample population mean. The finding ($M = 26.94$, $SD = 4.90$, $n = 55$) revealed that in a t-value of $t (54) = 8.991$, $p < .000$, hence the null hypothesis was rejected and the alternative hypothesis (see Table 1) was retained. This implies that teacher trainees significantly perceive teaching as a profession.

Table 1: One Sample t- test Analysis of UB Teacher Trainees Perceived Teaching as a Profession.

Variable	μ	Observed Mean	Std. Dev.	Mean Diff.	SEM	df	t	Sig. (2-tailed)
Professionalism of Teaching	21.00	26.946	4.904	5.945	.661	54	8.991	.000

When it came to gender influence on the level to which teachers perceived teaching as a profession, an independent t-test analysis done to test the second hypothesis showed that females ($M = 27.63$, $SD = 4.59$) significantly ($t = 2.45$, $df = 53$, $p = .018$) more than males ($M = 23.44$, $SD = 5.24$) perceive teaching as a profession. So there is a significant gender influence in the level to which UB teacher trainees perceive teaching as a profession. Females perceive teaching as a profession significantly more than males.

The rest of the six null hypothesis were together posited that the level to which UB teacher trainee perceive teaching as a professional does not significantly influence their (a) Motivation to achieve in teacher training programme, (b) attitude toward teacher training programme, (c) value of teacher training programme, (d) willingness to teach, (e) attitude towards teaching and (f) effectiveness of the training programme. In answering of all the six hypotheses, one way analysis of variance were conducted test dependent variables against independence variable in which UB teacher trainees perceive teaching as a profession (See Table 2). A One- way ANOVA was considered suitable for the analysis because the six dependent variables were measured at the interval level, whereas the independent variable, level to which UB teacher trainees perceived teaching as a professional, was categorical with three levels.

For the first dependent variable on the list, perceived level of motivation to achieve in teacher training programme, the ANOVA showed significant (*F = 5.87, p < .005)* result. This implies that of the level to which UB teacher trainees perceive teaching as be being a profession significantly influences their motivation to achieve in the teacher training programme (TTP). The significant of the F-value led to a post hoc analysis using least significant difference (LSD) method. It was found that teacher trainees with high level of perception of teaching as a profession differed significantly (p < .004) in their motivation to achieve in their training programme from those with average and low level of perception of teaching as a profession. In other words, the more UB teacher trainees perceive teaching as a profession the more is he/she is motivated to succeed in their TTP

Table 2: One-way Analysis of Variance (ANOVA) of the Influence of UB Teacher Trainees' Perception towards Teaching as a Profession on Attitude Towards Training Programme and Teaching

Variable	Perceived Level which Teaching is a Profession	n	$\bar{x}$	SD	SE	Source of Variation	SS	df	MS	F	Sig.
Motivation to Achieve	Low	21	14.90	2.36	.516	Between Groups	39.57	2	19.78	5.87	.005
	Average	26	16.19	1.63	.319	Within Groups	212.37	63	3.37		
	High	19	16.84	1.38	.318						
						Total	251.94	65			

	Total	66	15.97	1.967	.242						
Attitude towards programme	Low	20	44.45	7.67	1.716	Between Groups	573.09	2	286.59	5.53	.007
	Average	24	48.46	7.40	1.510	Within Groups	2745.17	53	51.80		
	High	12	53.83	5.02	1.450	Total	3318.14	55			
	Total	56	48.18	7.77	1.038						
Value of programme	Low	21	26.95	4.07	.888	Between Groups	215.69	2	107.85	7.51	.001
	Average	26	28.46	3.98	.781						
						Within Group	847.15	59	14.36		
	High	15	31.87	2.92	.755	Total	1062.84	61			
	Total	62	28.77	4.17	.530						
Effectiveness of Programme	Low	21	20.76	3.68	.804	Between Groups	390.29	2	195.15	15.49	.000
	Average	26	24.88	3.79	.743	Within Groups	806.21	64	12.60		
	High	20	26.75	3.04	.680	Total	1196.51	66			
	Total	67	24.15	4.26	.520						

Willingness to Teach	Low	21	55.38	6.71	1.465	Between Groups	1308.98	2	654.49	19.75	.000
	Average	20	63.10	5.08	1.135	Within Groups	1789.69	54	33.14		
	High	16	66.94	5.16	1.289	Total	3098.67	56			
	Total	57	61.33	7.44	.985						
Attitude towards Teaching	Low	22	16.86	2.82	.600	Between Groups	144.44	2	72.22	6.08	.004
	Average	24	18.25	3.93	.801						
	High	20	20.55	3.46	.773	Within Groups	748.04	63	11.87		
						Total	892.49	65			
	Total	66	18.48	3.71	.456						
Perceived Level to which Teaching is Stereotyped	Low	21	10.71	1.65	.360	Between Groups	129.586	2	64.79	7.48	.001
	Average	28	12.53	3.45	.651	Within Groups	563.355	65	8.67		
	High	19	14.32	3.23	.742	Total	692.94	67			
	Total	68	12.47	3.22	.390						

For attitude towards the teacher trainee programme, the analysis revealed a significant influence *($F = 5.53, p < .007$)* of the level to which teaching is perceived as being a profession on the attitude towards the teacher trainee programme. This led to rejecting the null hypothesis and retaining the alternative hypothesis, thus the level to which teacher trainees' perceive teaching as a profession does significantly influence their attitude towards teacher training programme. The significance of the F-value prompted a post hoc (LSD) analysis which showed that teacher trainees with high level of perception of teaching as a profession differed significantly ($p < .002$) from those who had an average and a low level of perception of teaching as a profession in their attitude towards teacher training programme respectively. Generally, the analyses revealed that the higher the level of perception of teaching as a profession, the more favorable the attitude towards the teacher-training programme is. That is to say, the more a UB teacher trainee perceives teaching as a profession the more favorable is his/her attitude towards their TTP

For the value of the teacher trainee programme, the analysis again showed significant influence ($F = 7.51, p < .001$) of the level to which teaching is perceived as being a profession on the value teacher trainees attached to their training programme. Given the significance of the F-value, a post hoc analysis using the LSD method was done. This analysis showed that those with high level of perception of teaching as a profession differed significantly ($p < .000$) from those who perceive average and low level of perception of teaching as a profession in the value they attached to their teacher trainee programme. The general trend showed that the higher the level of perception of teaching as a profession, the higher the value the teacher trainees attached to their training programme. In other words, the more a UB teacher trainee perceives teaching as a profession the more valuable he/she sees their TTP.

In the case of effectiveness of their training programme, the analysis showed significant ($F = 15.49, p < .000$) influence of the level to which teaching is perceived as being a profession on their perception of the effectiveness of the training programme. Given the significant F-value, a post hoc analysis using the LSD method was done. This analysis showed that those with high level of perception of teaching as a profession perceived their training programme significantly ($p < .000$) more effective than those with average and low level of perception. Similarly, those with average level of perception of teaching as a profession also differed significantly with those with low perception. Generally, the trend showed that the higher the level of perception of teaching as a profession, the higher the perception of the teacher trainees as being effective. That is to say, the more a UB teacher trainee perceives teaching as a profession the more effective he/she perceives their TTP to be.

For willingness to teach, the analysis showed significant ($F = 19.75, p < .000$) influence of the level to which teaching is perceived as being a profession on willingness to teach . Given the significant of the F-value, a post hoc analysis using the LSD method was done. This analysis revealed high level of teaching as a profession differed significantly ($p < .001$) with those who perceive average and low level of teaching as profession in their perception of the willingness to teach respectively. Generally, the analyses revealed that the higher the level of perception of teaching as a profession, the higher the willingness to teach.

For attitude towards teaching the analysis resulted in a significant F value ($F= 6.08, p < .004$) which led to rejection of the null hypothesis. In other words, it implies that the level to which teacher trainees' perceive teaching as a profession has a significant influence their attitude towards teaching. The significant of the F-value prompted LSD analysis which showed high level of teaching as a profession differed ($p < .002$) with those who perceive average and low level of teaching as profession in their perception of attitude towards teaching. Thus the analysis showed that the higher the level of perception of teaching as a profession, the higher the favorable attitude to teaching.

Lastly, for the perceived level to which teaching is stereotyped, the analysis showed significant ($F =7.48 , p < .001$) influence of the level to which teaching is perceived as being profession on the perceived level to which teaching is stereotyped. Given the significant of the F-value, a post hoc analysis using the LSD method was done. This analysis showed that teacher trainees who have a high level of perception of teaching as a profession differed significantly ($p < .001$) with those who have an average and low perception of teaching as a profession in their perception of teaching as a stereotyped career. Generally, the analyses revealed that the higher the level of perception of teaching as a profession, the higher its perception as a stereotyped career..

Summary of Findings

The findings of the study showed that in the perception of UB teacher trainees, teaching is a profession and this view is significantly stronger among female than male teacher trainees. Their level of perception of teaching as a profession has significant influence on their motivation to do well in their teacher training programme (TTP); attitude towards their teacher training programme (AtTTP), the value they attached to the programme (VaTTP); and their perception of the effectiveness of the programme (ETTP). Similarly, the level to which they perceived teaching as a profession has a significantly positive influence on their willingness to teach WtT); attitude toward teaching (AtT) and the level to which they perceive teaching as a stereotypes career (STC). Generally, the higher their perception of teaching as a profession, the higher their attitude towards their teacher training programme as well as towards teaching.

Discussion and Recommendation

Considering teaching as a profession field by teacher trainees, it's an imperative perception, which encourages the working environment for a teacher. It can boost teacher's cognitive and effective ability which can enable them to improve through innovative teaching and learning from teacher trainers and the teacher trainees. If the teachers are given the conducive environmental by regarding them as profession, they will in turn promote their work through explicitly training of human resource for the betterment of our society. The findings of this study corroborated Hargreaves et al., (2006) study who examined the perceptions of the status of the teaching profession and reveal large differences between the teaching profession and those professions judged to have high status in terms of reward and respect and as control and regulation. Teachers, trainee teachers and associated groups saw the teaching profession as virtually on a par with a high status profession in terms of the training, responsibility and performance that teaching requires.

The findings of this study confirm Botswana Government (1994), the white paper view the success of any education system depends largely on teachers. They are the catalyst of the learning process and on them mainly rest the whole system. The teacher trainees in Botswana as well perceived teaching is a profession by value teacher training programme, motivated by teacher training programme and willingness to teach as well as having highly favorable attitude towards teaching. These are crucial measures in which every teacher has to possess in order to achieve a more effective and responsive in any education system. This can only be attained only through an effective of teacher training programme, as attested by Marina-Stefania, Andrew and Angi (2011)'s findings, thus a good relationships with school-based mentors significantly boosted trainees' confidence that their initial teacher preparation had effectively prepared them for teaching. This in fact if teacher training programme is effective, it bring along teaching as a trusted profession as it combines statements about trust, integrity, and the desirability of having an influential and independent professional body for all teachers, with those teachers evaluating their work, using their professional judgment and directing other staff in the classroom (Hargreaves et al., 2006).

With regard to attitude of students towards teacher training programme in which was found significant and favored by those which high perception of teaching as a profession. This is an impressive findings of this study when at least people who are recruited in the teaching perceived it as a profession hence shall boost their joy and productive as a teacher. However a previous study by Peter and Peter (2011) was contrary to the current study which revealed that teacher trainees recruited perceive a range of perspectives for pursuing a teacher training course: failure to follow a desired career, springboard to other careers, to upgrade, and teaching out of vocation. It also showed that trainee teachers held a range of images about teaching: its ability to enhance knowledge; low pay with no incentives, low status profession, and lack of trust of male trainee teachers. Despite the contrary findings teaching as a profession like other philosopher put it, remains the mother of all professions.

Among recommendation is that teacher educators and policy makers need to consider the perspectives of effective teacher training geared towards professional development and effective education, in order to boost teachers' knowledge of, skills in, and attitudes towards formal and informal collaborative.

Reference

Babu, P. & Raju, T. J. M. S (2013). Attitude of student teachers towards their profession. *International Journal of Social Science & Interdisciplinary*, 2(1), 2277- 3630

British Department for Education (2010). The Importance of teaching. The Schools White Paper 2010. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/175429/CM-7980.pdf

Desimone, L. (2009). Improving impact studies of teachers’ professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38, 181–199.

ELAN.(2014)Advances in theory and practice of teacher professional development: Research program of ELAN institute for teacher training and professional development. University of Twente. *www.utwente.nl/elan/.../elan-research-program-2014-2018-july-2014.pd*

Government of Botswana (1994). The Revised National Policy on Education - Government Paper no. 2, Gaborone Government Printer.

Hargreaves, L., Cunningham, M., Everton, T., Hansen, A., Hopper, B., McIntyre, D., Maddock, M., Mukherjee1, J., Pell, T., Rouse, M., Turner, P., & Wilson, L. (2006). The Status of teachers and the teaching profession: Views from inside and outside the profession interim findings from the teacher status project. Department of Education and Skills, University of Cambridge and University of Leicester.

Kgalemang, T. (2015). We Failed you- Ministry of Education skills and Development. The Botswana Education and Training Sector Strategic Plan (ETSSP 2015-2020). Botswana Gazette. http://www.gazettebw.com/we-failed-you-moesd/

Marina-Stefania, G., Hobson, A. J., & Angi, M. (2011). Student teachers' perceptions of the effectiveness of their initial preparation. *European Journal of Education*, 46 (4), 456-473

Nenty, H. J. (2010). Threat of perceived stereotype on behaviour related to choice of and practices in teaching as a career among teacher trainees. *International Journal of Scientific Research in Education, 3(2), 82-93*

OECD. (2009). Teaching practices, teacher's beliefs and attitudes: Creating effective teaching and learning environments. Talis. *www.oecd.org/dataoecd/17/51/43023606.pdf*

Oguz, A. K., Unal, I. B., Murat. P., Duran, A., Lutfi. I., & Ergun, R.(2013) Evaluating Views of Teacher Trainees on Teacher Training Process in Turkey. *Australian Journal of Teacher Education, 38 (2),20.*

Peter, M., & Peter, G. (2011). What do secondary trainee teachers say about teaching as a profession of their "choice" in Malawi? *Teaching and Teacher Education: An International Journal of Research and Studies*, 27 (2), 424-433

Sahayarani, J.,& Stanly, S. L. (2014). Attitude towards teaching professional of B.Ed trainees in Pondicherry. *Indian Journal of Applied Research*, 4(11), 158 - 159

Tau, D. (2014).Teaching profession needs re-evaluation. Botswana, Gaborone: Sunday Standard. *www.sundaystandard.info/article.php?NewsID=20226&GroupID=5*

STEREOTYPE THREAT AND UB TEACHER'S TRAINEE'S ATTITUDE TOWARDS TEACHER TRAINING PROGRAMME AND TEACHING

H. J. Nenty
University of Botswana
hjnenty@yahoo.com

Fiji Phuti
University of Botswana
sithabilephuti@gmail.com

Sello Moyo
University of Botswana
sellmoyo@gmail.com

The threat posed by a group's reaction to a negative stereotype of a career tends to have a disabling effect on successful performance in such career. This might explain, to a significant level, the level of ineffectiveness often ascribed to the teaching profession. The study aimed at determining the level to which teaching is negatively stereotyped in Botswana and the influence of the ensuring threat on the attitude towards teacher training programme as well as towards teaching by UB teacher trainees. A statistical analysis of data from a quantitative survey of 68 UB teacher trainees with a 54 closed-ended validated Likert-type items showed that: teaching is significantly negatively stereotyped in Botswana; and the level threat ensuring from such behaviour did not significantly influence UB teacher trainees' attitude toward their training programme but significantly influenced their attitude towards teaching. These findings were discussed, implications drawn, and recommendations that followed directly from the findings were made.

Key words: Stereotype Threat, Teacher Training, Attitude Towards Teaching, University of Botswana (UB), Botswana

Introduction

Teaching is the first among all nation-building professions. Members of all other professions were 'built' or trained by education, and yet education is given a back seat at the congregation of professions when it comes to the allocation of extrinsic, especially intrinsic rewards by the society. In status, it is said to be inferior, and to Shaw (1903, cited in Ihne & Moller, 2014, p. 1) "he who can does, he who cannot teaches." These contribute negatively towards the motivation of teachers. Stereotype threat, as provoked by the influence of such feelings in the society, is explained by Ihme and Moller (2014) as a situational threat that diminishes performance due to a negative stereotype about one's own group. In connection to career stereotype, the teaching profession is no exception. Despite that teaching is labelled as a profession, when compared to other professions such as medicine, engineering and law, teachings scoops off low esteem (Ihme & Moller, 2014). Training programmes through which persons are professional prepared to accomplish the task of a teacher have been faced with a decline in enrolment due to a number of factors including negative stereotype of the teaching profession (Freedberge, 2013).

Maliki (2013) indicates that evidently because of the low status of teaching, candidates in Nigeria choose teacher training programmes as the last resort. When allowing the teaching profession to decline, you get a self-perpetuating future that goes downwards because good people don't go into it, and those who do go in don't find it satisfying elaborate Maliki (2013). Bringing in the experiences observed from the society at this juncture, societies including teachers have advised the young to not go into the teaching profession. There has also been negative publicity about the teaching profession. One may have the cognitive prowess, knowledge and skill but lacks intrinsic motivation and favourable attitude towards teaching and these impact on ones' teaching competency.

Stereotype threat demotivates and influences negatively what one can do and how devoted one performs a task or develops professional competence (Nenty, 2010). The teaching profession demands a clear set of goals, love for profession and obviously a favourable attitude towards the profession. The teachers` attitude is an important variable in classroom application of new ideas and novel approaches to instruction.

Background

Historically training of primary school teachers was the responsibility of teacher training colleges. Botswana's first primary teacher training was in Kanye which then relocated to Lobatse highlighted Major and Tiro (2012). Major and Tiro (2012) further explained that in the 1960's two teacher training colleges were opened in Serowe village and Francistown. These institutions provided certificate and diploma level. However the colleges admitted standard seven leaves and junior certificate failures thus Major and Tiro (2012) elaborate that teacher education was of low quality in those years. After Botswana gained independence quality education was a priority. To improve the quality of teacher education, the Commission recommended raising the quality of entrants to the teaching profession from junior certificate failures to those who passed junior certificate (Major & Tiro, 2012, p. 2).

The University of Botswana developed educational higher programmes which were of degree, now master and PhD level. Though teaching was once more of a masculine career and was valued, it is now known to be more female oriented, with low paid wages and less motivation. Today the teaching profession is no longer attractive to many people as it was in the past and as such a career stenotype has been built in this profession. Such stereotype catches up with pre-service or enrolling students thus having a negative impact upon them.

While reflecting on the current trends in teacher training, the programme do not enrolled failed candidates but those who do not make it into other professions or are pushed to the faculty of education explained Maliki (2013) thus the notion 'He who can, does; He who cannot , teaches as stated by Ihme and Moller (2014). Stereotype upon the teaching programme has built a negative attitude among students. Maliki (2013) further elaborates that students accept admission letters from the faculty of Education for the sake of not staying home but end up not performing well academically or dropout. It is with this great disclosure that this study embarks on the stereotype threat and teacher trainers' attitude in the University of Botswana.

Theoretical Foundations

Stereotype Threat

Stereotypes are shared beliefs about a phenomenon or members of a group of a given group ignoring individual differences. DeRouin, Fritzsche and Salsa (2003) elaborate that stereotyped people become concerned, upset, agitated and as a result motivated to compensate for the threat. Stereotype threat refers to being at risk of confirming as a self-characteristic, a negative stereotype about one's own social group (Steel, 1997). Steel elaborates that there is evidence pointing to the role or reduced cognitive capacity in mediating the effects of stereotype threat on complex cognitive processing tasks. Stereotype threat experience involves the cognitive, affective and psychological processes that work to drain cognitive, affective and psychomotor capacity needed for successful performance. DeRouin, Fritzsche and Salsa (2003) explained that stereotype threat undermines academic achievement by interfering with performance on mental tasks, overtime stereotype promotes victims to protect their self-esteem by disguising from the threatened domain. Steel found the domain of African American to be a stigmatised group who were vulnerable to fear of being judged with negative stereotype. The author stresses that this fear impairs performance relevant to stereotype associated with that particular group.

Venable (2015) enunciated that one of the factors that influence career choice is culture, the beliefs of the people. Beliefs shared by groups often shape our values and expectation including career. As such, teachers are preserved as a trivial group, the beliefs hold a shared schema at inter group relation and thus trickles down to individual level. Performance can be undermined because of the concerns that possibly confirm negative stereotype about the teaching career.

The social cognitive career theory was developed from Banduras social cognitive theory stressed Mill (2009). Social cognitive career theory proposed that career choice is influenced by the beliefs that individual develops and refines through four major sources: (a) personal performance accomplishments, (b) vicarious learning, (c) social persuasion and (d) physiological states and reactions (Mill, 2009, p. 11). Theory stipulates that confidence in one's self attribute to successfully outcome expectations hence influence an individual's interest. Many different activities are attempted through a person's educational career, but generally a persistent interest is only developed in activities in which the person expects to be successful and in which a positive outcome is anticipated (Lent & Brown, 2006).

Problem and Purpose of the Study

The extent to which teacher trainees consciously or unconsciously imbibe others' negative perceptions about teaching as a career tend to have negative influence on or pose a threat to their training- as well as teaching-related behaviour. Such threat inhibits maximum exhibition of behaviour desirable for achievement by teachers and this turns around to hurt the society who, in the first place, expressed negative view of teaching as a career. There is stereotype threat among pre-service students or teacher trainees. Academic under-performance of groups that face negative stereotypes is well documented (DeRouin, Fritzsche & Salsa, 2003). To Nenty (2010) stereotyping a profession tends to undermine both the cognitive and affective dispositions of members of that profession in carrying out what is required of them in the professions. Belittling the teaching profession has led to less enrolment, dropping out and poor performance by students explained Maliki (2010). Career stereotype on teaching has brought about negative attitude leading to poor competence in the profession.

The purpose of this study is to determine the extent to which the perception of University of Botswana (UB) teacher trainees about stereotyping teaching as a career influences their attitude to the teacher training programme they are currently undertaking as well as their attitude towards teaching. To achieve this purpose, the following research hypotheses will be tested in the null form:

1. To UB teacher trainees, teaching is a significantly stereotyped career.
2. The level to which UB teacher trainees perceive teaching as a stereotyped profession significantly influence their/the:
   i. Motivation to achieve in their teacher training programme (MATTP);
   ii. Attitude towards their training programme (ATTP);
   iii. Value attached to their training programme (VATP);
   iv. Effectiveness of training programme (ETTP);
   v. Willingness to teach (WTT);
   vi. Attitude towards teaching (AtT); and
   vii. View of teaching as a profession (VTaP).

Significance

The findings from this study will contribute to the field of teacher training by working on the possible beliefs, attitude and stereotype found. The Ministry of Education and Skills Development; Faculty of Education, University of Botswana and other teacher training institutions will benefit from the findings of this study as they will provide information with which teacher trainees can be counselled. Furthermore, these researchers have suggested that investing in the attitude of teacher training students would yield high returns in future educational and employment outcomes. The finding from this study will educate the society at large on the need not to stereotype careers.

Literature Review

Stereotype Threat and Teaching

According to Ambady, Shih, Kim, and Pittinsky (2001), "a growing body of research indicates that the activation of negative stereotypes can impede cognitive performance in adults, whereas positive stereotypes can facilitate cognitive performance" (p. 385). Teacher and pre-service teachers are subject to considerable negative stereotype (Ihme & Moller, 2014). These authors further explain that teachers more than other occupational groups, are viewed as less competent, and they are confronted with these negative stereotypes even during their training. Ihme and Moller carried out a study in which the subjects were divided into three groups. The study used pre-service teachers with a sample size 264 where 72% of the population hence of the sample were females. The participants were randomly assigned. With the third group, an experimental design was carried out with a control and experimental groups. The experimental group was exposed to stereotype threat. The experiment tested the hypothesis that competence-related stereotype threat leads to weaker performance by pre-service teachers.

The study found out that members of the group associated with a negative stereotype performed less well on a test of cognitive ability. This study was well designed, though the researchers could not eliminate the unnoticeable everyday life stereotype and stereotype reactance. Random assignment of subjects made it suggestible to carry out the study. Howey and Gardner (1983) in the same line of thought with Ihme and Moller (2014) explain that, introducing a negative stereotype about a social group in particular domain can reduce the quality of task performance.

A similar study carried out by Nenty in 2010 at the University of Botswana determined the level to which stereotype threat was perceived and how it affected performance of students. Data was collected through a 48 item questionnaire which was distributed to 452 pupils. One way analysis of variance was used to find out the influence of perceived level of stereotype of teaching as a career on teachers behaviour by UB education students. The findings revealed that negative stereotype of the teaching profession affect the performance of teachers during training and at work. Nenty (2010) highlighted that, "the stereotype view of teaching as a career by Botswana society creates a psychologically hostile working environment within which teachers operate" he further explained that stereotype reduces teachers' cognitive and affective investment on teaching and learning by the teacher and the teacher trainees.

Attitude of Teacher Trainees

A study (Maliki, 2013) examined attitudes of teachers towards teaching profession in Bayelsa State Nigeria. Carried out as a descriptive survey research, a questionnaire was distributed to 150 randomly selected teachers in the state. The study's finding showed that most teachers had a negative attitude towards teaching though a few thought of it as a humanitarian job. The teachers were not happy since government treated teachers poorly, teachers stated to have low social value and teachers were not respected nor valued by others in their society. Maliki (2013) elaborated that teachers in Bayelsa state stress being dissatisfied with their jobs and would not recommend the profession to any child. It wasfound out that clearly female teachers had a more positive attitude towards teaching as compare to male secondary teacher. Maliki (2013) states that teachers should not be looked down upon by society but rather as moulders. She further gives recommendation that the government of Nigeria should propose an attitudinal change by member of society towards teaching through salary increment.

Pathy and Bhargava (2014) investigated attitude of student teachers towards teaching profession. The authors used the teacher attitude inventory which was administered to 100 B.Ed. student teachers. The tool was a Likert scale with four options. The study reveals that female science teachers had more positive attitude towards teaching than males. Pathy and Bhargava (2014) elaborate that new teachers enter the teacher training programs with already establish belief but pre-service teacher training programmers help in shaping the attitude of teacher trainees by providing a series of experiences incorporated in the curriculum.

A study carried out by Erbas (2014) investigated on the relationship between alienation levels of physical education teacher candidates and their attitude toward teaching profession in turkey. A good sample size of 695 teachers candidates in Physical education were candidates answered a questionnaire divided into personal information form, student alienation scale and an attitude scale towards the profession of physical education. Erbas (2014) study revealed that there was a negative weak relationship between professional love sub division and meaning, nomles and ownerless sub division. Teacher candidates felt that the curriculum content did not prepare them for the job. Erbas highlights that alienation; threat can be caused by school administration and academics. Society should engage professional love for education careers. He adds that alienation should be reduced to avoid professional concern which will enhance professional love.

Sharbain and Tan (2012) emphasis that success of a teacher is upon knowledge competence and attitude. Mutum (2007) agrees with two authors that the quality of teacher education programme is further very much related with their potentialities of its student-teachers-their interest, aptitude, attitude, abilities, personality, achievement, motivation as well as their mental and academic achievement level.

Mutum (2007) stresses that when an individual has negative attitude towards anything, he will not be able to lead his life successful. Contrary to the above findings, Mutum (2007) carried out a study in India which investigated whether the pre-service student teacher of college of teacher Education reading B.Ed. course have negative or positive attitude towards the teaching profession. The study used a normative survey research method with a zero pre-service student teacher of B.Ed. the data was collected through a self-developed attitude scale. The study revealed that 78% pre-service students in India, Imphala east and west campus of Nagaland University have a positive attitude towards the teaching profession since they believe that teaching is the best educational social service for mankind.

Methodology

This is a quantitative survey study that finds out the perception of teacher trains attitude attributed by stereotype threat. The participating students were sixty eight teacher trainees from bachelor of education programmes of University of Botswana (UB) and post graduate diploma in education (PDDE). A questionnaire of 54 close-ended items and one open-ended items was developed, face validated and pilot tested as an instrument for the study. administered. Section 1 of the questionnaire requested for demographic information, while the second section involved open ended questions with a Likert type item of 6 options, from very strongly agree to very strongly disagree. Section 3 was open ended questions. Reliability of the items was carried out. Data was collected and coded. It was then entered into SPSS Version 22 for analysis. A population t-test and one way analysis of variance (ANOVA) were done to test the two hypotheses posit to guide the study. Ethical consideration was observed as a consent letter informing of confidentiality and the study was provided to the participant.

Data Analysis

Hypothesis I

To UB teacher trainees, teaching is not a significantly stereotyped career. To test this hypothesis, a population t-test analysis of the level to which UB teacher trainees perceive teaching as a stereotyped career was done. There were a total of 68 participants, compare to a population mean of 10.50, the observed sample mean of 12.470 and a standard deviation of

3.215 (see Table 1). A comparison of both means gave a $t_{(67)}$= 5.053, p < .05. Given the observed t-value which is greater than the critical t-value of 1.98 at .05 alpha level, the null hypothesis was rejected. Hence there is a significant difference between the estimated population mean and the observed population mean on the level to which UB teacher trainees feel that teaching career is stereotyped. That is, to UB teacher trainees, teaching is significantly stereotyped in Botswana society.

Table 1: Level to Which UB Teacher Trainees Feel that Teaching is Stereotyped Occupation (df = 67)

μ	$\bar{X}$	SD	Difference		t-value	Sig.
			$\bar{X}$	SED		
10.50	12.471	3.216	1.971	0.390	5.053	.000

Hypotheses II

The level to which UB teacher trainees perceive teaching as a stereotyped profession is not significantly influence by their/the: (a) motivation to achieve in their teacher training programme (MATTP); (b) attitude towards their training programme (AtTP); (c) value attached to their training programme (VATP); (d) effectiveness of their training programme (ETTP); (e) willingness to teach (WtT); (f) attitude towards teaching (AtT); and (g) view of teaching as a profession (VTaP).

The significance of the influence on each of these variables by the level to which UB teacher trainees perceive teaching as a stereotyped career was tested by carrying out a one-way analysis of variance (ANOVA) for each of the listed variable (see Table 2). For motivation to achieve in their teacher training programme (MATTP), the analysis gave an F-value of 1.42 (see Table 2). With 2 and 63 degrees of freedom and .05 alpha level

There is no significant influence of teacher trainee level stereotype of teaching on the motivation to achieve teacher training programme at the p < .05 level, (F(2, 63) =1.42, p = .250), Attitude to achieve teacher training program, (F(2, 53) =.742, p = .481) Value to teacher training programme (F(2, 69) = .885, p= .418). Effectiveness of teacher training programme, (F(2, 64) = .998, p= .374). The significant value was more than .05. The null hypothesis was failed to be rejected.

Table 2: One-way Analysis of Variance (ANOVA) of the Influence of Level to which Teacher Trainee Perceive Teaching to be Stereotyped on Their Attitude towards Teacher Training Programme (TTP) and Teaching

Variable	Level of Stereo -type	n	$\bar{x}$	SD	SE	Source of Variation	SS	df	MS	F	Sig.
Motivation to Achieve During	High	16	15.44	2.16	.54	Between Groups	10.84	2	5.42	1.42	.250
	Average.	32	15.91	2.12	.37						
	Low	18	16.56	1.38	.33	Within Groups	241.10	63	3.83		

	Total	66	15.97	1.97	.24	Total	251.94	65			
Attitude towards TTP	High	18	49.00	8.51	2.00	Between Groups	90.35	2	45.18	.742	.481
	Average.	28	46.96	7.95	1.50						
	Low	10	50.10	5.70	1.80	Within Groups	3227.86	53	60.90		
	Total	56	48.18	7.77	1.04	Total	3318.21	55			
Value of TTP	High	16	28.25	3.66	.92	Between Groups	30.94	2	15.47	.885	.418
	Average.	32	28.47	4.33	.77						
	Low	14	30.07	4.38	1.17	Within Groups	1031.90	59	17.49		
	Total	62	28.77	4.17	.53	Total	1062.84	61			
Effectiveness of TTP	High	16	23.75	4.58	1.15	Between Groups	36.183	2	18.09	.998	.374
	Average.	32	23.66	4.37	.77	Within Groups	1160.32	64	18.13		
	Low	19	25.32	3.74	.86						
	Total	67	24.15	4.26	.520	Total	1196.51	66	18.09		
Willingness to Teach	High	14	58.64	8.59	2.30	Between Groups	619.80	2	309.90	6.75	.002
	Average.	28	59.75	6.61	1.25						
	Low	15	66.80	4.93	1.27	Within Groups	2478.86	54	45.91		
	Total	57	61.33	7.44	.99	Total	3098.67	56			
Attitude towards Teaching	High	16	17.00	2.28	.57	Between Groups	176.70	2	88.35	7.78	.001
	Average.	32	17.75	3.89	.69						
	Low	18	21.11	3.16	.74	Within Groups	715.78	63	11.36		
	Total	66	18.49	3.70	.46	Total	892.49	65			
Professionalism of Teaching	High	14	24.43	4.33	1.16	Between Groups	413.46	2	206.73	12.14	.000
	Average.	26	25.77	4.56	.89						
	Low	15	31.33	2.94	.76	Within Groups	885.38	52	17.03		
	Total	55	26.95	4.90	.66	Total	1298.84	54			

Table 3 displays the results from one way ANOVA of the influence of teacher trainee' level of stereotype of teaching on willingness to teach ($F(2, 54) = 6.75$, $p = .002$) attitude towards teaching ($F(2, 63) = 7.778$, $p = .001$) and professional of teaching ($F(2, 52) = 12.142$, $p = .000$) . The significant values were less than .05 hence the null hypothesis was rejected. There is a significant influence of teacher trainees' level of stereotype of teaching on attitude towards teaching, professionalism of teaching and willingness to teach.

Following the significant influence of level of stereotype of teaching as a career on willingness to teach, attitude toward teaching, and professionalism of teaching determined through ANOVA as presented on Table 2, there was the need for post-hoc (LSD) analyses to determine exactly which of the three levels of stereotype make the differences. As displayed in Table 3 indicates that student teachers with low level of stereotype are significantly more

Table 3: Post Hoc (LSD) Analysis of the Influence of Level of to which Teacher Trainee Perceive Teaching to be Stereotyped on Their Attitude towards Teaching.

Dependent Variable	(I) Level to Which Teaching is Stereotyped	(J) Level to Which Teaching is Stereotyped	Mean Difference (I-J)	Std. Error	Sig.
Willingness to Teach	High	Average	-1.10714	2.21774	.620
		Low	-8.15714*	2.51779	.002
	Average	High	1.10714	2.21774	.620
		Low	-7.05000*	2.16790	.002
	Low	High	8.15714*	2.51779	.002
		Average	7.05000*	2.16790	.002
Attitude towards Teaching	High	Average	-.75000	1.03206	.470
		Low	-4.11111*	1.15814	.001
	Average	High	.75000	1.03206	.470
		Low	-3.36111*	.99310	.001
	Low	High	4.11111*	1.15814	.001
		Average	3.36111*	.99310	.001
Professiona-lism of Teaching	High	Average	-1.34066	1.36786	.332
		Low	-6.90476*	1.53339	.000
	Average	High	1.34066	1.36786	.332
		Low	-5.56410*	1.33790	.000
	Low	High	6.90476*	1.53339	.000
		Average	5.56410*	1.33790	.000

willing to teach, have significantly more favourable attitude and see teaching as a profession significantly more than those with high and average levels of stereotype.

Summary of Findings

UB teacher trainees who differ in the level to which they perceive teaching as a stereotyped career do not differ significantly in the level to which they are motivated to achieve in their teacher training programme (TTP); in their attitude towards their training programme (ATTP); in the level of the value they attach to their training programme (VATP);

and in their perception of the effectiveness of their training programme (ETTP); but differed significantly in their level of willingness to teach (WTT); in their attitude towards teaching (ATT); and in their view of teaching as a profession (VTAP). Hence while the level to which UB teacher trainees perceive teaching to be stereotype does not have any significant influence on their feeling about their training programme, it has significant influence on their feeling about teaching. Teachers who perceived teaching to be highly stereotyped as well as those who perceived it to be of average level of stereotype differ significantly from those who perceived it to be of low level of stereotype in their level of willingness to teach, attitude towards teaching, and in their perception of teaching as a profession.

Discussion

The findings reveal that stereotype correlated positively with the dependent variables motivation to achieve in teacher training programme, attitude towards teacher training programme, value of teacher training programme, willingness to teach, attitude towards teaching and professionalism of teaching. The dependent variables have a positive relationship yet attitude showed the weakest relationship. The hypothesis tests revealed no relationship between stereotype of teaching and attitude towards teaching, value of teacher training and effectiveness of teacher training program, thus the weak relationship. This finding indicated that attitude could be used as an independent variable. Attitude of teacher have been related to students achievement and teacher behaviour in schools. Milner and Hoy (2002) stated that teachers with higher attitude are more open to new ideas, and are creative. This finding linked to the theory of stereotype is that teachers of high stereotype threat shy away from their profession and lack enthusiasm of the career. Ayodele and Adeyoju (1995) explained that, the level of attitude towards a particular task produces a corresponding level of the performance if the task is not well accepted.

The study revealed that there is significance in the level to which University of Botswana teacher trainees feel that teaching is a stereotyped occupation. Teacher training student significantly stereotype teaching as a career. Nenty (2010) carried out a similar study, the finds of the study revealed that students stereotyped teaching. Maliki (2009) in her study indicated that teachers were likely to negatively influence their children into choosing teaching as a career. A lot of factors are document to cause a stereotype upon the profession. Historically teacher went from being men oriented to women oriented. Since society has cultural viewed women as a weaker gender, teacher was viewed as women s occupation thus belittles. This is supported by the study of Dodeen, Ibrahim and Emad (2003) that showed that attitude of teachers have been determined to be influenced by gender and that female teachers have more positive attitude towards teaching profession as compared to male teachers. Maliki (2009) found out that the low wages, low social value, lack of recognition and respect has led to stereotype threat of the profession. The dissatisfaction of the teaching environment and the stereotype threat attributed in the society results in alienation upon teacher training students.

The finding indicated that teacher training students who had a high level of stereotype threat differed significantly with the average level of stereotype and low level of stereotyped students. Nenty (2014) revealed that the higher the level of stereotype threat the less favourable the student’s attitude towards the teacher training programme. The higher the stereotype threat the more influence on attitude towards teaching. Maliki (2013) explained that stereotype threat may interrupt learning during training.

The risk of confirming self-characteristics based on a cultural belief has and impact on teacher training students thus affect the effectiveness of the educational teacher training programs. Norris (2014) has explained that academic performance can be harmed by awareness that one’s behaviour might be viewed through the lens of career stereotype. Norris

(2014) stereotype threat goes beyond underachievement in schools leading to loss in sense of belonging, reduced practiced time for a task and reduce the degree to which students value a programme.in the same line of thought, this study revealed that teacher training students who perceived teaching as a stereotype had low willingness to teach, attitude towards teaching and low professionalism to teach.

Conclusion and Recommendations

The choice made to enter the teaching carrier should be like the choice made by an individual to enter any other occupation. Teaching as gone through much metamorphosis over the past decades in terms of motivation, qualification, structure, this changes have lead many individuals to reject teaching as a career. Many others enter the profession unwilling but as means to survive. The exclusion of stereotype threat on pre-service teachers might take a long way towards realizing the dream that the careers of teachers and the processes of teacher education be treated as a continuum of professional growth. Nenty (2010) elaborates that Encouraging teacher to positively think of their profession, in ways that reduce the salience of a threatening identity can attenuate stereotype effects. This study recommends that further research be carried out to find out ways of reducing stereotype threat among teaching profession.

References

Ambady, N., Shih, M., Kim, A., & Pittinsky, T. L. (2001). Stereotype susceptibility in children: Effects of identity activation on quantitative performance. Psychological Science, 12(5), 385-390

Ayodele, S. O., & Adeyoju, C. A. (1995). A study of Nigerian teachers' attitude towards the teaching profession. Nigeria Journal of Education Research, 2 (1), 8 –17

Bhargava, A., & Pathy, M. (2014). Attitude of students' teachers towards teaching profession. Retrieved from. Turkish Online Journal of Distance Education, 15, 26-36.

DeRouin, R. E., Fritzsche, B. A., & Salas, E. (2003. Stereotype threat and training performance. Retrieved from https://www.psychologicalscience.org/cfs/program/view_submission.cfm?Abstract_ID=348

Dodeen, H. A., Ibrahim, A. A., & Emad, M. (2003).Attitude of pre service Teachers towards persons with disabilities: Predictions for the success of inclusion. College Student Journal, 37(4), 515-521

Erbas, K., A. (2014). The relationship between alienation levels of physical education teacher candidates and their attitudes towards the teaching profession. Australian Journal of Teacher Education. 39, 37-52. Retrieved from http://files.eric.ed.gov/fulltext/EJ1032090.pdf

Freedberge, L. (2013). Enrolment in teacher preparation progress plummets. Retrieved from http://edsource.org/2013/enrollment-in-teacher-preparation-programs-plummets-2/63661#.VVEKWHv06WI

Howey, K. R., & Gardner, W. E. (1983). The education of teachers — a look ahead. New York: Longman Inc.

Ihne, T. A., & Moller, J. (2014). "He who can does; he who cannot, teaches?" Journal of Educational Psychology, © 2014 American Psychological Association

Lent, R. W., & Brown, S. D. (2006). On conceptualizing and assessing social cognitive constructs in career research: A measurement guide. Journal of Career Assessment, 14, 12-35.

Major, E., T., & Tiro, L. (2012). Theory vs practice: the case of primary teacher education in Botswana. International Journal of Scientific Research in Education, 5, 63-70. Retrieve from http://www.ijsre.com/Vol.,%205_1_-Major%20&%20%20Tiro.pdf

Maliki, A, E. (2013). Attitudes towards the teaching profession of students from the faculty of education, Niger Delta university. International Journal of Social Sciences, 1, 11-18. Retrieved from http://mgseb.umk.edu.my/journals/download/IJSSR042013008AgnesEbiMaliki.pdf

Mills, l. (2009). Applying social cognitive career theory to college science majors. Retrieved from http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1687&context=etd

Mutum, R. (2007). Attitude of pre-service students- teacher of CTE (B.ED. course) towards teaching profession. Retrieved from www.Academia.edu/6519875/attitude-of-preservice-student-teacher

Nenty, J.,H. (2010). Threat of perceived stereotype on behaviour related to choice of and practices in teaching as a career among teacher trainees. International Journal of Scientific Research in Education. 3(2), 82-93. Retrieved from www.ijsre.com.

Norris, A. (2014). What is stereotype threat. Retrieved from http://www.reducingstereotypethreat.org/definition.html

Sharbain, A., & Tan, K. (2012). Pre service teachers level of competence and their attitudes towards the teaching

profession, 1, 23-31. Retrieved from http://www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.1%283%29/AJSSH2012%281.3-02%29.pdf
Shaw, G. B. (1903). Man and superman "Maxims for Revolutionists" Constable
Venable, M. (2015. What influences your career choice? Retrieved from http://www.onlinecollege.org/2011/05/17/what-influences-your-career-choice
Steele, C. (1997). A threat in the air: How stereotypes shape intellectual identity and performance. American Psychologist, 52, 613–629.
George Bernard Shaw, Man and Superman (1903) "Maxims for Revolutionists" Irish dramatist & socialist (1856 - 1950)

THE ROLE OF LANGUAGE IN THE TEACHING AND LEARNING MATHEMATICS

Grace Njuguna
Syracuse University
gnnjugun@syr.edu

As we think about quality teacher education, the language used for instruction is an inevitable piece. Language is a vehicle for learning across various academic disciplines. In a school context, there are two types of languages that are often used: the everyday language and the academic language. Language plays a pertinent role towards meaningful learning and learners must possess language competency in order to comprehend materials they are expected to learn. In light of this, every teacher aiming at quality teaching should put into consideration aspects of the academic language. Drawing on scholarly literature, I am going to focus on a widely adopted language of instruction – Standard Academic English – and show how, if not well understood, this could pose formidable challenges to learners in the learning of mathematics, and in particular to English second learners, typical of a Kenyan child.

Keywords: Academic Language, Mathematics register, Vocabulary teaching, and Mathematical English

Introduction

In a classroom, language is a major tool for learning across various academic disciplines and learners are expected to have language competency in order to meaningfully comprehend the materials they are expected to learn. There are two types of languages that are used in a school set up: the everyday language (the language used by students and teachers to talk about everyday occurrences outside the classroom), and the academic language (the formal technical language that is standardized, discipline specific and used in the classroom for instruction) (Shatz & Wilkinson, 2013).

In addition, Shatz and Wilkinson (2013) noted that learning involves language, and a student must know how to read and write for learning to occur. This is to say that language can either be oral or written, but the point is, the parties involved have to understand the language used for a change to be experienced. Thus, we can say that learning and language is inseparable.

In this paper, I am going to focus on a widely adopted language of instruction – Standard Academic English (SAE) – as used in the teaching and learning of mathematics. Following this, the questions of concern are: what role does language play in mathematics? And, does understanding the language used in mathematics matter in any way? To help us address these questions, I will draw on scholarly literature to discuss the formidable linguistic challenges that students face while using SAE in the learning of mathematics. In addition, I will discuss whether mathematics vocabulary teaching is pertinent, and if it is, how should mathematics vocabulary be taught. Finally, I will discuss some of the strategies that teachers can use to develop students' mathematical language.

Most of the time, especially for mathematics teachers, whenever the concept of language in mathematics is mentioned, vocabulary teaching comes to mind. I am not undermining this idea, but as we shall see, mathematics register requires more than just vocabulary teaching. In order to understand the role of language in the teaching and learning of mathematics, it is pertinent to first understand three things: what is the mathematics register, what the mathematics register entails, and how it is different from another register.

Mathematics Register

Herbel-Eisenmann, Johnson, Otten, Cirillo and Steele (2014) defined a register as “a set of meanings, words and structures expressed through these meanings, suitable to a particular role of language” (p. 2). This would imply that every register is different from another in terms of its role and that every discipline has its own register. This also means that the academic language register is different from the everyday conversational language register. Thus, we can say that the mathematics register is the register that applies to the language used in teaching and talking about mathematics. To understand this better, let us look at what makes the mathematics register different from another register.

There is compelling evidence (Biber et al., 2011; Fang, 2006; Irujo, 2007; Schleppegrell, 2010; Scott & Balthazar, 2010; Wilkinson & Silliman, in press), that academic English required in schools is more complex and precise than everyday conversational English. Indeed, these researchers describe the mathematics register as characterized by:

1. A specialized vocabulary that includes technical and abstract terms, such as: Pythagoras, probability, quotient, isosceles, hypotenuse, sine, cosine, and tangent.
2. Use of more general vocabulary words, such as: factor, frequency, line, curve.
3. Use of everyday words that have specific mathematics meanings, but at the same time have other meanings, such as; product, prove, difference, area, function, expression.
4. A specialized syntax, in other words, sentence structure that includes use of prepositions such as: by, into, and, of, a, if and then, which defines significant mathematical relationships; for example, “divided into” may have a different implication than “divided by.”
5. Use of passive verbs, for example, which is the largest among the following? “Which” in this case represents something not mentioned explicitly.
6. Use of elaborated noun phrases leading to high lexical density.
7. Use of mathematical symbols that have own syntax; for example, 2n is different from 2^n.
8. Lack of order between symbols and the words they represent; for example, in an algebra question like, the number m is 10 less than the number n, some students may write the equation m = 10 – n as read, which is wrong, without realizing the correct equation should be m = n - 10.
9. Specialized ways of communicating, both in written and oral forms when giving mathematical explanations, following directives such as: find, calculate, evaluate, justify, make conjectures, prove, define, and others that are non-mathematical like simplify.

The above features make the mathematics register distinct from other registers, and pose formidable challenges to students, particularly to English Language Learners (ELLs). Research indicates that teachers are aware of the complexity of mathematical language, but when asked to identify the linguistic features cited above, they also face a challenge (Irujo, 2007). Irujo (2007) noted that teachers end up picking out vocabulary words as the main challenge, not being aware of other underlying linguistic features. This calls for the need to provide mathematics teachers with Linguistic Responsive Education during their pre-service preparation, which would enable them to identify such linguistic challenges and be able to help ELLs. Also, by understanding the mathematics register, teachers will develop more appreciation of the role of language in the learning and teaching of mathematics.

Mathematics Vocabulary Teaching

As mentioned previously, vocabulary teaching is considered to be a pertinent factor in the teaching of mathematical language. Before reaching this conclusion, the following questions should be addressed: How do we teach vocabulary in a mathematics class? Is it enough to give definitions of words or ask students to refer to their dictionaries? What does effective vocabulary teaching entails? Which should come first, concept teaching or language teaching?

These are relevant questions that every mathematics teacher should consider when thinking of the role of language in the teaching and learning of mathematics.

Researchers such as Garrison and Kerper (1999), Irujo (2007), Nagy and Townsend (2012) and Snow (2010) emphasized the importance of not only teaching vocabulary definitions, but also teaching the definitions within authentic contexts. For instance, Snow (2010) argued that vocabulary should not be taught as mere words or labels; instead, vocabulary should be taught and learned in meaningful contexts. This implies that, if for instance, the teacher is to teach fractions, defining what a fraction is and introducing a procedural algorithm of completing fractions operations may not help students to develop a deeper understanding of fractions. Instead, students need to be provided with meaningful activities – such as congruent paper strips, which could be cut into halves, thirds, fourths, etc. – and enable students to model and interpret fractions, before they are taught a definition of a fraction.

In addition, Snow (2010) asserted that for effective vocabulary teaching and learning to occur, students should have multiple exposures to new words, as this will enhance their vocabulary understanding. As mentioned earlier, some words have multiple meanings (polysemy). Thus, students should be introduced to such words frequently in order to develop depth and breadth of their vocabulary knowledge.

Also, students should be taught the structural analysis of various elements of words and identification of possible false cognates. False cognates refer to pairs of words in the same or different languages, similar in form and meaning, but having different roots. For example, “pen” and “pencil”, “human” and “man”, or “why” and “wae” in Korean, which means “what for.” By students analyzing the structure of a word and identifying false cognates, they can enhance their understanding of mathematical words.

Garrison and Kerper (1999) suggested that concept teaching should precede vocabulary teaching. They asserted that, by students learning first the concept and later the vocabulary, they can connect the new “label” to the known concept, enhancing their understanding of the vocabulary. The researchers followed Krashen’s (1981) theory of incomprehensible input of language-concept connection, which states that, “to teach an unknown concept, one has to use a known language and vice versa” (pp. 35-40). Following this, teachers should always devise ways of dealing with one unknown, so that students do not encounter two unknowns.

Language and Mathematics Assessment Tests

Does language matter in mathematics assessment tests? Researchers have found that ELLs and English proficient speakers (EPSs) performed exemplary well in linguistically modified test items, when compared to non-modified parallel items (Abedi & Lord, 2001; Abedi, Lord & Hofstetter, 2000). These findings presented compelling evidence that language used for assessment in mathematics can either have a positive or negative impact on the performance of students. If students do not understand the language of assessment, learning outcomes will be adversely affected. This implies that instructors should devise strategies of making the language of assessment meaningful to learners.

Language and Mathematics Textbooks

The above observations made by Abedi and Lord (2001) and Abedi et al. (2000) should apply not only to assessment materials, but also to all instructional materials. Research suggests that textbooks used for instruction are also characterized by the heavy linguistic demands discussed earlier (Biber et al., 2011; Fang, 2006; Schleppegrell, 2010; Scott & Balthazar, 2010). In light of this, Akhodi, Malayeri and Samad (2011) suggested the need for students to be taught text structural analysis. Teaching text structural analysis would help students to identify main ideas, major ideas, and supporting details as presented in textbooks, making it easier for them to comprehend the language used.

Strategies for Developing Students' Mathematical English

Last but not least, strategies for developing students' mathematical language are worth considering, particularly for ELLs who struggle with both academic and conversational language. Following this, the question we need to ask ourselves is how can we ensure as teachers that we have responded to students' diverse language needs in a mathematics classroom? To address this question, I suggest the following strategies:

1. Provide opportunities for students to work in small groups, think-pair-share arrangements, and whole-class discussions. This creates opportunities for students to communicate the mathematical language as they share their ideas and thinking with others, hence sharpening their communication skills.
2. Provide opportunities for language code switching for multilingual students who speak the same language at certain times. This can be made possible by structuring participatory groups in such a way those students from the same language background work together, along some EPSs. This would enhance their mathematical understanding, as they relate their first language with English as a second language.
3. Make instructional materials relevant to the students by providing familiar scenarios, necessary modifications of texts and tests, and the use of multiple representations in mathematical vocabulary teaching.
4. Provide students with multiple exposures of the use of words both in written and in spoken forms by having them explain their mathematical reasoning.
5. Provide students with mathematical activities and projects that require them to draw from outside the classroom in order to develop a productive disposition that is part of mathematical proficiency.

Conclusion

In a nutshell, we can conclude that language and concept learning are intertwined. Language is a vehicle by which the learning process occurs. Effective learning of mathematics will only occur where instructors appreciate the role that language plays. Students need to be provided opportunities to develop their mathematical language as they do mathematics, which can be seen in their production of both spoken and written mathematical reasoning.

As argued above, the language used in instruction and assessment materials matters. Students should be provided with culturally relevant and familiar scenarios while doing mathematics. This will motivate students towards engaging with presented tasks and foster their willingness to engage in mathematical talks. It is pertinent to identify with the students' home culture by asking them to give examples of mathematical games or other activities from their home. This would foster students' sense of identity and their productive disposition, which will lead to home-school connection.

Teaching of vocabulary can also foster students' understanding of mathematical English. However, as we have discussed, for effective vocabulary teaching this should be done in authentic contexts and after concept teaching. This would ensure that students do not encounter two unknowns at the same time.

Finally, teachers need to familiarize themselves with the linguistic features of the mathematics register. This would help them to identify with the linguistic challenges that students encounter while learning mathematics. In light of this, teachers would be able to devise ways of helping students to overcome the challenges. To this end, we can say that language plays a very pertinent role in the teaching and learning of mathematics and it should be our ultimate goal to ensure that students develops the required language competency.

References

Akhondi, M., Malayeri, F. A., & Samad, A.A. (2011). How to teach expository text structure to facilitate reading comprehension. *The Reading Teacher*, *64*(5), 1-7.

Balthazar, C., H. & Scott, C., M. (2010). The grammar of information. Challenges for older students with language impairments. *Top Language Disorders*, *30*(4), 288-307.
Biber, D., Gray, B., & Poonpon, K. (2011). Should we use characteristics of conversation to measure grammatical complexity in L2 writing development? *Tesol Quarterly, 45*(1), 5-35.
Fang, Z. (2006). The language demands of science reading in middle school. *International Journal of Science Education, 28*(5), 491-520.
Garrison, L., & Kerper Mora, J. (1999). Adapting mathematics instruction for English language learners: The language-concept connection (pp. 35-47). In Ortiz-Franco, Hernandez & Y. De La Cruz (Eds.), *Changing the faces of mathematics: Perspectives on Latinos*.
Herbel-Eisenmann, B., Johnson, K. R., Otten, S., Cirillo, M., & Steele M. D. (2014). Mapping talk about mathematics register in a secondary mathematics teacher study group. *Journal of Mathematical Behavior.*
Irujo, S. (2007). So just what is the academic language of mathematics? *The ELL Outlook, 6*(3).
Nagy, W., & Townsend, D. (2012). Words as tools: Learning academic vocabulary as language acquisition. *Reading Research Quarterly, 47*(1), 91-108.
Schleppegrell, M. J. (2007). The linguistic challenges of mathematics teaching and learning: A Research Revie*w. Reading and Writing Quarterly, 23*(2), 139-159.
Shatz, M. & Wilkinson, L. (2013). *Understanding language in diverse classrooms: A primer for all teachers*. New York & Oxford UK: Routledge Taylor Francis.
Silliman, E. & Wilkinson, L. C. (in press). Two challenges of the academic language register for students with language learning disabilities. In Bahr, R., & Silliman, E. (Eds.). *Routledge handbook of communication disorders*. New York, NY: Routledge Taylor Francis.

MENTORING IN PRE-SERVICE TEACHER EDUCATION: THE CASE OF A DEVELOPING COUNTRY, KENYA

Moses K. Ochanji
CSU, San Marcos
mochanji@csusm.edu

Nicholas W. Twoli
Kenyatta University
nocholastwoli@yahoo.com

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

John N. Maundu
Kenyatta University
maundujohn52@yahoo.com

The subject of teacher mentoring has attracted worldwide attention in recent times. This paper presents an account of a pre-service teacher-mentoring project undertaken in Kenya through a partnership of Kenyatta University, Kenya and Syracuse University, USA. The purpose of the study was to understand the effectiveness of the collaborative mentoring model on pre-service teacher training. The implementation of the project employed an evaluative survey design evaluating the mentoring process. Findings from the study indicated that the collaborative mentoring has the capacity to enhance teacher development at the pre-service level. However, there is no policy at the university or national level to guide the implementation of mentoring in teacher education. The paper recommends the establishment of a policy on teacher mentoring in pre-service teacher education at university and national levels. Such a policy could address aspects such as the roles of each participant in the mentoring process.

Introduction

Teachers are central to national development. They are an important resource in the teaching/learning process and their training and utilization therefore requires critical consideration. The government programmes for teacher education aim at providing qualified teachers and are, therefore, central to ensuring the provision of quality education. The objectives of teacher education programmes aim at developing communication skills, professional attitudes and values that equip teachers with the knowledge and ability to identify and develop the educational needs of the child *(Task Force on Education, 2012).* The teaching process demands designing and implementing deliberate plans to achieve intended objectives. To do so one has to consciously and carefully select appropriate content, resources and instructional strategies that seek to attain the desired outcomes. Such a task can be daunting especially to the novice teachers graduating from colleges and universities and those on training practicum. There is therefore a need to put into place a mechanism for guiding trainees and also inducting novice teachers into the teaching profession. Thus, by definition, such a programme would have to be a *mentoring* one in which the novice is assisted to settle into the teaching career with relative ease.

The majority of secondary school teachers are trained at public universities and diploma colleges and are required to have specialized in two teaching subjects upon graduation. Currently, the class sizes in universities are too large for lecturers to pay special attention to specific methodology and therefore the quality of the teacher is often compromised. In order to improve the quality of the teachers graduating out of our universities, it is imperative that the secondary school teacher training programme is restructured to enable the trainees acquire sufficient subject mastery and pedagogy.

Mentoring is the establishment of a personal relationship for the purpose of professional instruction and guidance. In education, mentoring programmes are implemented for pre-service teacher induction and continuing teacher development. Mentoring provides mentors with the opportunity to impart their knowledge and experience and reflect on their own journey.

Statement of the Problem

In Kenya, as in other countries throughout the world, there are regular pre-service teacher training programmes that comprise theory and practical components. This practice is faithfully implemented continually without due regard to how the graduates leaving universities and other tertiary educational institutions each year transition into their professional career. For a novice secondary school teacher, this transition can be mired by challenges such as the interpretation of the curriculum, selection and/or designing of instructional resources, planning for teaching, appropriate implementation of teaching plans and evaluation of teaching effectiveness. Such novice teachers need structured guidance to enable them to gain deeper understanding of the functioning of the school and the teaching process. It is our considered view that pre-service teachers should receive induction into the profession during their Teaching Practice (TP) otherwise referred to as *Practicum*. Such induction can take the form of teacher mentoring which is a necessary process for all teachers preparing to enter into the teaching profession in order to ensure that their practice is firmly anchored on professional ethics and practice. Since there is no officially functional system of inducting pre-service teachers in Kenya, there is need for establishing a firm, official mechanism of anchoring such teachers on sound functional professional base so as to, in turn, ensure acceptable learner development in the institutions that these graduating teachers will be posted to. This is the basic reason for developing a professional pre-service teacher-mentoring programme for Kenya. Many teacher-training institutions in developing countries are beginning to explore other effective ways of teacher professional development. Teacher mentoring programmes, the world over, are increasingly getting perceived as an effective form of development for beginning or training teachers. The significance of mentoring for beginning teachers has been gaining wide recognition in developed countries (Pungur, 2007) but it is still at a slow formative stage in developing countries. However, as attention continues to be focused on teachers as a key factor in educational reform, and on their need for on-going improvement and support, teacher mentoring becomes a viable option in education policy.

Objectives of the Research Project

This paper examines how secondary school pre-service teacher training can be enhanced through a structured mentorship programme. It attempts to respond to the following questions as regards the role of veteran teachers in the provision of quality teacher preparation: *What are the different ways in which pre-service teachers are inducted into the teaching profession? What role can the practicing teacher play in inducting the new teacher into the profession?* (These questions highlight teachers' expected roles and missions within the education system). *What is the effect of mentoring on student teachers?* By analysing 3rd and final year student teachers' induction into the teaching profession through a mentoring programme, we aimed to understand the effect of mentoring on teacher training.

Teacher Mentoring

In education a mentor is an experienced and a trained teacher who guides a teacher on practicum or a novice on professional matters. It is, therefore, important that a mentor is a teacher with experience and should have gone through some relevant training. Teacher mentoring can be a valuable process in educational reform for beginning teachers. Besides helping others to develop and improve their personal and professional potential, mentoring is a meaningful and useful leadership skill. This is so because to mentor is "to support and encourage people to manage their own learning in order that they may maximize their potential, develop their skills, improve their performance and become the person they want to be" (Parsloe, 2000).

In addition to managing and motivating people, it is also important in helping young incoming teachers to learn, grow and become more effective in their job. Such a responsibility requires proper training to facilitate reasonable and meaningful delivery of the said service. By establishing teacher mentoring programmes, pre-service teachers could be guided effectively to develop their instructional skills during practicum or teaching practice and novice teachers are given a strong start at the beginning of their careers.

Research identifies various mentoring models and different institutions in different parts of the world have various modes of organizing teaching practicum. These variations have been occasioned by a number of factors such as the economy, research knowledge or preference (Bozeman & Feeney, 2007; Twoli, 2011). These factors have been used by different institutions to come up with models of teaching practice. Two progressive models have been used in the pre-service teaching practice. These are: (a) the Corporate Model which is regarded as the traditional model and (b) the more improved Collaborative Model which uses experienced teachers as mentors (Twoli, 2011).

The Corporate Model

The corporate model can be regarded as the basic and traditional model that has been used in many parts of the world. This model is still persistent in developing countries for various reasons. It is economical in its operation and can be managed and sometimes abused by generalists. This model allows students to apply for schools of their choice and are posted as per their requests by a university or college coordinator. Placement of the pre-service teachers is controlled by the needs of the schools. They select the teachers with the subjects where there is a shortage (Figure 1).

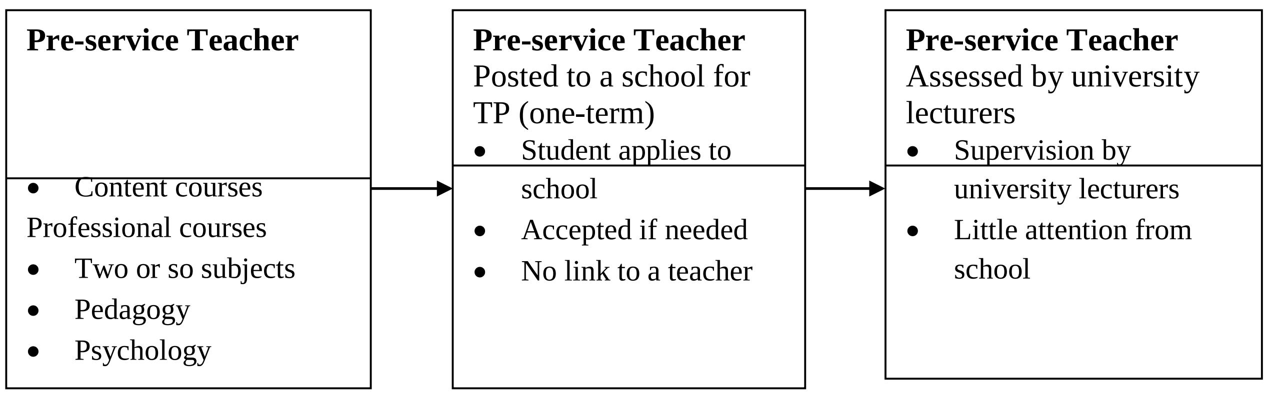


Figure 1: The Corporate Mentoring Model

There are times, indeed when a pre-service teacher is placed in a school where there is no other teacher in the subject area, a situation which makes the pre-service teacher "the head of the department" since he or she will be the only one in the department. There is almost no interaction with the teachers and administration. Even where there is a co-operating teacher who is supposed to guide the pre-service teacher, experience has shown that in some schools, the co-operating teacher simply takes leave and abandons the practicing teacher to go it alone. How is such a teacher going to be guided? When it comes to assessment, the pre-service teachers are assessed directly by lecturers or tutors from the university or college. These assessors arrive and go straight to the classrooms to assess the student teachers. From the classroom, they go away hurriedly, giving very little regard to the school environment.

The Collaborative Professional Model

The Collaborative Mentoring School (CMS) model is rooted in the principles of reflective practice where the student teacher is asked to critically examine their actions and the context of those actions. In order to reflect on their responsibilities and performance, student teachers are required to keep a professional reflective journal. Issues from the journal are discussed with the mentor teacher and the university supervisor. This model is similar to the Inquiry Based Model (Nguyen, 2009) typically used in the United States in which the mentoring process is structured with a triad of participants including the student teacher, the mentor teacher and the university supervisor. “The triad of cooperating teachers, student teachers, and a college supervisor engaged in on-going and purposeful discourse to explore the teacher–learner (expert–novice) reciprocity, school culture and social relations” (p 655). In both the CMS and the inquiry-based models, the roles of each member of the triad are carefully outlined.

The central player in this model is the mentor teacher. A mentor teacher would be an experienced teacher in the school who provides front line advice, support and feedback to the student teacher. Mentors in general use their experience to assist student teachers in developing classroom management skills, gaining familiarity with methodology, use of resources, lesson planning, assessment and reflective practice. It can be summarized that mentors generally provide guidance and model professional behaviour through the development of supportive relationships and also play an evaluator role.

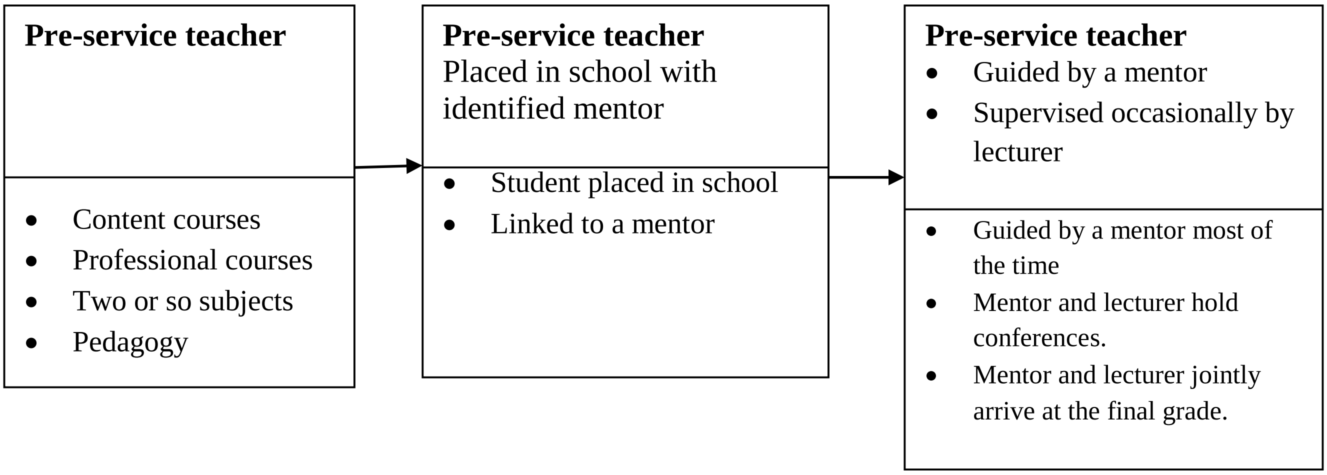


Figure 2: The Collaborative Professional Model

The critical stage in this model is the placement time. Prior planning and even agreement is needed before the posting stage. The training institution needs to have some standing agreement with the school and even at times with the mentors. The training institution will be required to play diplomacy or use some policy to work with schools. At times it may come down to working only with those schools which “match with your policy and have willing experienced teachers to act as mentors.”

One assumption that is often made in the mentoring initiative is that all experienced teachers are competent as mentors. This assumption cannot be taken for granted because effective mentors should have certain qualities as identified by Tilley (2002):

> Mentors need to be committed to the educational exercise and to take an interest in the personal and professional development of the mentee. Mentors need to be flexible enough to tolerate and appreciate the uniqueness and individuality of the mentees. (p. 17)

For an effective mentoring relationship to develop it is crucial that the mentor has good interpersonal skills and the ability to listen very attentively, deal with differences of opinion in a non-judgemental manner, ask open-ended questions rather than closed ones, focus on the protégés' agenda, show flexibility and be creative, and use all the above interpersonal skills for the benefit of the practising teacher.

The co-operating teacher is the one who assigns lessons to the practising teacher, and introduces the practising teacher to the class and to the school requirements and regulations. In addition to all these, the co-operating teacher has the role to act as a link between the practising teacher and the mentor. This is the person who is vast in the content and hence is suited to guide or assist the new teacher. Where possible, and particularly at the start of the exercise, the co-operating teacher has the option to sit in class to ensure that the teacher is 'doing things right'. The training institution has its representation and role in this model. There is the university coordinator who has the main roles of placement (posting) of pre-service teachers or students in suitable schools. This is often a very delicate task as there has to be a mentor-student teacher link. This can be quite a headache especially if the population requiring placement is large. The university co-ordinator has also another role that is of overall administration; he has to ensure that the mentor process is working well and the right university assessors (supervisors) are in the field to observe and bring feedback for records.

The last person with an important role in the model is the university supervisor. This should be a person established in teacher development. Such a person will observe the student-teacher in class. After observing lessons, he/she would arrange for conferencing with the mentor and the teacher for purposes of giving advice. Usually, this would end in an evaluation process when the supervisor and mentor jointly come up with an agreed grade. In most cases, certain characteristics define a strong student-teacher link and that is why a university supervisor would not just engage in subject-specific support but also content. In sum, the university supervisor's main task is to open and maintain communication between the parties (Willems, 1986).

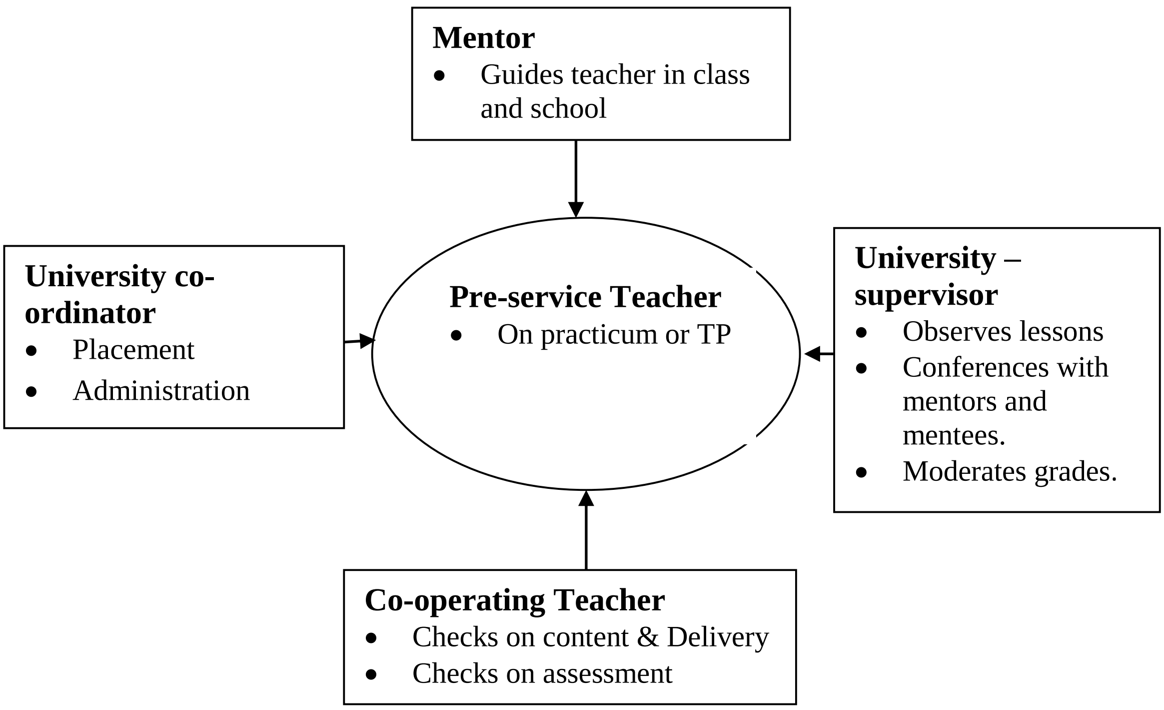


Figure 3: School-University Partnership in Collaborative Model Theoretical Framework

Teacher mentoring is grounded in the reflection theory. The interaction between the mentor and the protégé is based on activities that identified in the reflection theory. Dewey (1933) regarded reflection as problem solving or thinking about solving a problem, which involves action chaining. Thus, according to him, reflection is an active and deliberative cognitive process, which involves reflective thinking and reflective action. Schön (1983, 1987) presents two forms of reflection, that is, reflection-in-action, which he describes as reflection that happens while action (e.g. teaching) is still occurring; and reflection-on-action, which he describes as reflection that occurs after the event. Clearly, Schön's definition of reflection is intrinsically related to action. According to him, through reflection and action, professionals are bound to make rational judgements about how to modify their actions and find new ways of doing them while in action (reflection-in-action) or after the action has occurred (reflection-on-action).

With regard to teacher education, Zeichner (2009) and Hall (1985) claim that emphasizing reflection too soon in their preparation turns novice teachers off and become difficult to sustain. The assumption is that the neophytes tend to perceive it as a worthless distraction that takes their attention away from mastering the content and teaching skills they are particularly anxious about. However, when reflection is imbedded in the mentoring process, such fears are reduced since the mentor is available to offer direction on the challenges posed by the reflection process. The reflection should be an integral component that is incorporated in all the teaching skills and not be seen as a separate entity, regardless of the students' level of study as this would enhance their holistic growth and development. In the context of teacher mentoring the reflection process occurs in a sequential set of steps (figure 4). The process is done collaboratively between the mentor teacher and the mentee.

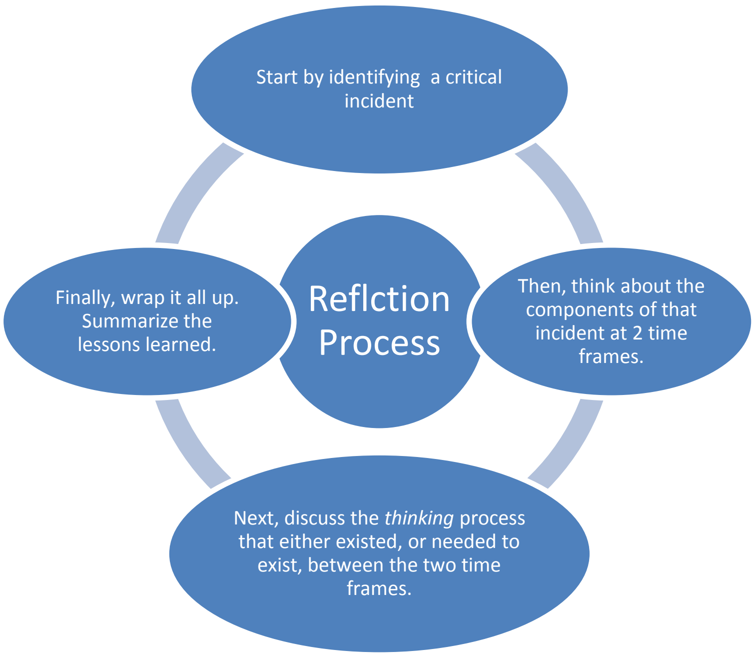


Figure 4: The Reflection Process

Methodology

As part of a partnership project between Kenyatta University and Syracuse University, U.S.A. we undertook to understand the effectiveness of the collaborative mentoring model on pre-service teacher training in a developing country like Kenya. The implementation of the project employed an evaluative survey design involving the training of teacher mentors, mentoring of selected pre-service teachers and evaluation of the mentoring process. The study focused on the following research questions: What are the different ways in which pre-service teachers are inducted into the teaching profession? What role can the practicing teacher play in inducting the new teacher into the profession? What is the effect of mentoring on student teachers? By analysing 3rd and final year student teachers' induction into the teaching profession through a mentoring programme, we sought to understand the effect of mentoring on teacher training.

We collected data through questionnaires and classroom observations and interviews. The main instruments used included (a) Classroom Observation Feedback Form that was used mainly by the mentor teachers to observe a TP- student teaching in class. This was followed by a conference between the student teacher and mentor teacher. (b) Mentor Teacher Record Form. This required the mentor to give documented and progressive performance on key skills by TP- students. The main areas emphasized were planning, class-management, instructional skills, integration of resources, evaluation and lastly, professional growth. (c) Student –Teacher Questionnaire. This was meant for TP students being mentored and also non-mentored teachers for purposes of comparison. (d) Questionnaire for mentors which sought to find out their impressions on a number of issues. Such issues included: work load; school contribution and co-operation; mentor – teacher relationship; challenges and benefits of teacher mentoring, and (e) Interview Schedule with the School Principals which to gauge whether the principals appreciated and supported the programme.

Selecting and Training Mentors

The success of the mentoring programme depends on the proper selection and training process. According to Gray and Gray (1985), the selection should emphasize experience, commitment, and time to assist pre-service or novice teachers. Another characteristic which was been emphasized during the selection process for effective mentors was "a willingness to nature another person" (Freedman, 1993). This means that the individuals recruited as mentors should be people-oriented, open-minded, flexible, empathetic and collaborative. One major characteristic which was emphasized in the selection of teachers in this study was 'experience' in the field and a period of five years and above was conceived as good enough. Nevertheless other characteristics such as commitment, people-oriented etc. were considered and were used by the school administration in recommending the teachers.

The selection process commenced with the areas or regions. The study had to limit the population to match the resources. With this in mind two regions, four schools and thirteen teachers were selected for the training as seen in Table 1 below. The composition of the teachers was rather skewed with respect to gender. This was partly occasioned by the attempt to match the protégés (TP students) with the mentors. The condition made the gender ratio of male: female to be 4:9.

Table 1: Distribution of Teacher Mentors in Schools

Regions	Schools	Teachers
Region A	**3**	
	1 – Girls' school	4
	1 – Boys' school	3
	1 – Mixed school	3
Region B	**1** Girls' school	3
Total	**4**	**13**

The training of mentors was organized and managed by five faculty members of the Department of Educational Communication and Technology. They brainstormed first before this was followed by preparation of the notes and the programme structure.

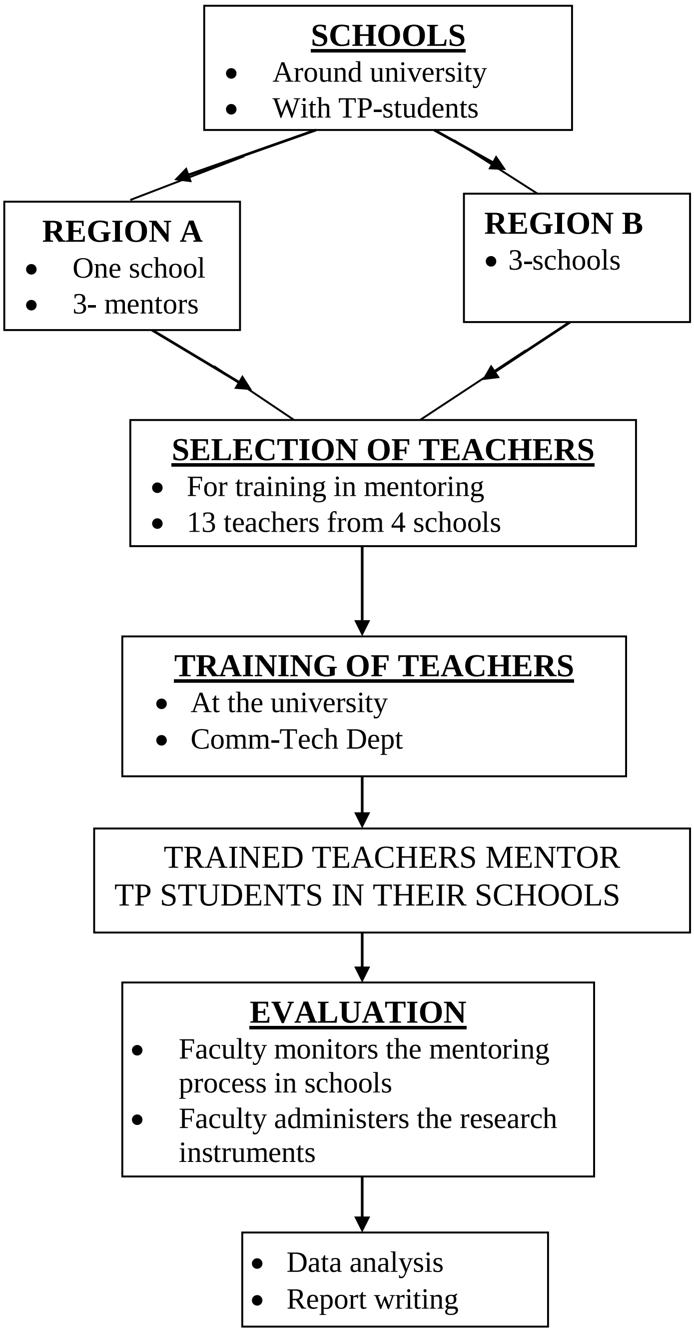


Figure 5: The Research Stages

The teachers were invited to the department for a one-day workshop. The training emphasized the concept of mentoring, relationship skills, effective teaching, models of supervision and coaching, conflict resolution and lesson evaluation. After the workshop, the mentors implemented the mentorship programme in their schools and were monitored and evaluated for one school term, which is usually twelve effective weeks. The main purpose of training teacher mentors was to aid them to have the key knowledge and skills that would be useful in identifying and responding to teaching practice teachers needs that create an atmosphere that is collegial in engaging mentors and practising teachers.

Table 2: Teachers, Gender and Subject Distribution

Schools	Teachers		Gender	Subjects
Region A Girls' HS	1	Teacher A	F	Eng/Lit
	2	Teacher B	F	Home Sc.
	3	Teacher C	F	Chem/Geo
	4	Teacher D	F	Hist/CRE
Region A Mixed H.S	5	Teacher E	F	Geo/CRE
	6	Teacher F	F	Hist/CRE
	7	Teacher G	M	Kis/Bus
Region A Boys' H.S	8	Teacher H	M	Mat/Phy
	9	Teacher I	F	Kis/CRE
	10	Teacher J	F	Eng/Lit
Region B Girls' School	11	Teacher K	F	Hist/CRE
	12	Teacher L	M	Mat/Chem
	13	Teacher M	M	Kis/Hist

Matching Mentors and TP Students

One of the design aspects that needed attention in the teacher mentor programme was the mentor TP-student pairing up. The main consideration in pairing up was the subject combination. Mentors were paired up one-to-one with practising students who had the same subject combinations. This pairing criterion was preferred mainly because it aided mentors to effectively take charge of both the pedagogical and content domains in coaching.

Data Analysis

The main focus of the study was on mentors in the four schools. There were thirteen mentors who trained but later one could not practice mentoring because the TP student got a transfer at the last minute. This explains why the data in this report will be reflecting a total of twelve teachers comprising three males and nine females.

The data analysis emphasized descriptive statistics mainly because of the small size of the information resulting from a small sample. As mentioned earlier, a number of instruments were used to gather the information. These included; Classroom observation form, Mentor record form, Student-teacher questionnaire, Questionnaire for mentors, and an interview schedule with school principals. The data analysis was facilitated by the SPSS programme.

Findings and Discussion

Benefits of the Mentoring Process to Mentees

The main purpose of the mentor programmes is to help beginning teachers make a successful transition into teaching by relying on the expertise of the experienced teachers to provide a clinical, real-word training process. The study was interested in identifying the main benefits of mentoring to TP students. A questionnaire and an interview were used to acquire this information. What were the main benefits? The most common benefit that came out strongly was "the immediate and relevant feedback." This was valued greatly by TP students. As one student teacher put it:

> It was so settling to have somebody to consult any time in case of a problem. It is not like when you only rely on university supervisors who come after a long time…………

meanwhile you may continue making same mistakes.

We see that relevant and immediate feedback is fundamental to the process. It was *relevant* because the mentors were in the same subject area and *immediate* because mentors were available for mentees all the time since they were in the same school. Other benefits reported included the following: (a) the TP students appreciated the process of teacher mentoring because it gave them a fast start. They were able to settle a lot faster regarding writing schemes of work, lesson plans, and general orientation to school rules and places. (b) The help and the fast settlement were like a form of acceptance to the school. Consequently it helped them to build confidence in and the motivation towards the profession. This is useful to young and beginning teachers as they are likely to love the profession and stay for a long time. In the long run, the retention rate of teachers can remain high. (c) The protégés were with the mentors for an extended length of time. This gave the practicing teachers ample time to get elaborate and valid guidance. Examples that were given to reinforce this point related to tasks like setting and marking Continuous Assessment Tests CATS; developing instructional resources and participating in co-curricular activities.

Comparing the Performance of Protégés and Non-protégés

The idea of comparing some aspects of instruction among mentees and non-mentees was of interest to the study. This was done towards the end of the mentoring exercise, which was at the end of the school term. A questionnaire was used for this purpose. It was administered to all the mentees and the same number of non-mentees in the schools within the same environment. A major aspect in the questionnaire sought to know within how many weeks protégés and non-protégés were able to grasp the structure and interpretation of some instructional instruments or procedures. The results are displayed in table 3. The distribution shows that the mentees got going early. If we take the case of writing a scheme of work, it is observed that six mentees mastered the structure of a scheme of working a week as compared to only four non-mentees. This applies to all other items in the table. This does confirm the general statement that was emphasized by mentees in reference to the major merits of mentoring programme that it gives mentees a fast start.

Table 3. Time Taken to Grasp the Structure and Perform Some Tasks

Task	**One week**		**Two weeks**		**Four weeks**	
	M	NM	M	NM	M	NM
To write scheme of work	6	4	6	8	-	1
To write a lesson plan	9	5	3	5	-	3
To deliver content confidently	8	3	3	4	1	6
To maintain discipline in class	5	2	5	6	2	5
To respond to questions from learners	8	5	2	6	2	2

M = Mentees **NM** = Non-mentees

The other measure of comparison between mentees and non-mentees was the rate of feedback they gave to their learners. They were asked to indicate (4) for more often, (3) sometimes, (2) rarely, (1) never. The following results were obtained.

Table 4. Rates on modes of feedback

Mode of Feedback	Mentees	Non-mentees
Questioning	3.88	3.10
CATS	2.40	2.12
Assignments	2.50	1.25
Practical/Projects	3.12	2.20

The frequency of the mentees is higher than that of non-mentees, which is an indication that mentees sought or used feedback more frequently, and this could be attributed to the mentoring effects.

Benefits of Mentoring Process to Mentors

Using a questionnaire and an interview, mentors were probed on the benefits of the process. The following main points were given; (a) Mentors were very delighted with the realization of satisfaction to develop as a professional. They could observe a TP-student come up from scratch to a constructive teacher. They felt that this improvement is as a result of their effort and guidance. (b) The other benefit that mentors sounded was the opportunity to be more reflective. As they advised the beginning teachers, they too, had to make sure that were confident in what they were advising. For example, they had to be sure of the content, lesson planning and suitable methodologies. This gave the opportunity to mentors to refresh on all these areas. These refreshed and professional knowledge and skills would then be incorporated in the mentors' lessons, thus improving their performance as well and adds to professional growth for mentors. (c) The mentors had the opportunity to interact with the university staff, an opportunity that lays ground for academic and professional consultations. Such an opportunity can be used to consult, for example on further education and even references for jobs or promotions.

Challenges Faced by Mentors

Nearly all teacher mentors reported a successful session with the TP students. They however addressed some areas that can loosely be referred to as challenges. One challenge was to do with planning for instruction. One requirement every mentor was to fulfil was to guide the mentees on planning. One of the tasks in the planning stage was to ensure that TP students write lesson plans and schemes of work. This proved a challenge to some mentors for two main reasons. First, some mentors have not been in the habit and rhythm of frequent planning and were apparently not sure of the planning process e.g. writing a lesson plan. They had to 'refresh' on lesson planning and for some this took a while. Second, was the fact that while the TP-students were familiar with the Kenyatta University format of lesson planning, some mentors had trained from other universities which used different formats. This meant, learning the Kenyatta university format first before guiding TP-students.

The other challenge that mentors faced was to do with the lack of synchronization of the mentor free timetable time and TP student teaching time. It often happened that when the mentor was teaching, the student teacher was also teaching. The overlap of teaching time for both mentor and the mentee denied them adequate classroom interaction (observation), which is a key task in the mentoring process.

The official supervisors of the TP students were the university staffs, who are often referred to as clinical supervisors. There are times when there were conflicts in advice between the one given by the mentor and that by the clinical supervisor. This does throw the TP-student in confusion. While the practising student teacher might be aware that the mentor is the more effective because he/she is in the subject area, the practicing teacher is also well aware that the clinical supervisor awards the final grade. The design of the study did not officially recognize the mentor's grade. The mentors and the mentees were basically at the same level in terms of academic level. This made some mentors to feel that they did not have greater authority over the mentees. In response to this situation, some mentors proposed a form of course that would elevate mentors to a higher level, preferably a master's course in mentoring and instruction.

Teacher Mentoring and Workload

Mentors were asked to indicate how many TP students they were comfortably able to mentor. This question was put to them after going through the mentoring experience at the end of the school term. The response was almost by unanimous, as most of them indicated that were comfortably able to guide two TP students. They qualified by emphasizing that this was only possible if TP-students are in the same school. A number of mentors had justification for this number of two on the grounds that the mentors were involved in managing their lessons in the two subjects and they needed adequate time to guide mentees in such activities as classroom observations and conferencing. The mentors were further asked to indicate how many times they were able to observe mentees teaching in a classroom or a laboratory. The results in Table 5 show a good effort by the mentors. On the average, they were able to observe a TP student five times. Through interview, we were able to gather that the variation in observation was due to the teaching load and also on the overlap of the lessons on the school timetable. The average classroom observation by most teacher training institutions is four.

Table 5. Number of classroom observations by mentors

# of mentors	Frequencies	Totals	Mean
3	4	12	$\frac{66}{12} = 5.5$
4	5	20	
3	6	18	
2	8	16	
Total 12		**66**	

If mentors can manage the indicated observations, then all that the university can do is just to "fill in" with one or two clinical observations to complete the TP exercise. This of course does assume that the mentors still do a good job when it comes to full-scale mentor programme.

A part from the observation of lessons in classrooms one of the main tasks, teacher mentors were required to guide or check on other instructional related activities. Such activities included the nature and quality of homework TP students gave to their learners:

1. Checking on the scheme of work
2. Checking and advising on the lesson plans
3. Observing and advising on classroom management issues
4. Monitoring the evaluation strategies including setting for CATs
5. Teacher mentors were asked to indicate the frequencies given to these activities.

The rate or frequencies of attention in one school term was quite reasonable, with an average of just over four. Given that one school term has about ten active weeks, this comes to teacher mentors giving attention at least once every two weeks. This is not a bad rate considering that they are busy with other regular school activities.

Table 6. Some tasks performed by mentors

Role performed	Frequency
Checking and advising on the homework	4
Advising on syllabus coverage	2
Checking on lesson plans	4
Advising on class management	5
Checking on evaluation strategies	7
Totals	**22 Mean = 4.4**

School Administration Support

School administrators have a crucial role to play if the teacher mentor programme is to be successful. This role was greatly realized in the design and progression of this programme. It was realized from the beginning that seeking (a strong) link with the school administration would open way for other activities planned for the teacher mentoring. It is with this understanding that we made it a priority to contact the school administration to seek for permission to train their teachers and use the school for mentoring our teaching practice students. The request was put personally and in a note to school principals by explaining the nature and the benefits likely to accrue from it. It was with a lot of delight that all school administrators welcomed the idea of launching the programme in the schools.

This study received overwhelming support from administration, especially when it came to providing a conducive environment. The programme was announced at the school parade and the teachers involved introduced. The school as a whole was asked to support the programme.

There were a number of issues that the school administration was not immediately ready to facilitate. For example, the school was not ready to reduce the number of lessons for mentor teachers, or to re –arrange the timetable to suit the programme or to participate in supervising the programme. Nevertheless, this did not seriously affect the programme. The provision of a supportive school climate was supreme. Some school administrators were keen to monitor the programme activities and went on to appreciate the benefits. There was this one school where our students were being mentored. There were, however, other TP-students from other institutions who were not on the programme and therefore were not being mentored. They looked left out and felt they were missing something important. This observation lead to the administration to request that, they too, should be included in the programme. Reports indicate that these TP-students from other institutions appreciated the coaching by our mentors.

The Role of the Teacher Mentor in the University Supervision Process

Both the mentors and the mentees reported the need to separate the supervision by mentors and that of the university supervisors. The supervisions were done independently and there was no given time that mentors and university supervisors observed a lesson together. This separation is important considering that the observations serve different purposes. While the mentors focused mainly on teacher development, the university supervisors emphasized the element of assessment. Classroom observation is essential in providing information about a TP-student and mentor or clinical supervisor. The mentor can use this information to provide quality advice while the TP student can use the information to improve in planning and presentation of lessons.

While the mentors focused mainly on teacher development, the university supervisors emphasized the element of assessment. The main goal of mentor supervision should be to bring improvement in teacher performance (Olivia & Pawlas, 1994) rather than to generate a grade for entry in the university transcript. In a way, we therefore expected the moods on behaviour of the TP-students to be different. To be more relaxed with the mentor than with the university supervisor. The use of clinical supervision techniques can radically change the supervisor-teacher relationship and may result in less stress and anxiety on the TP teacher.

The observation cycle recommended to teacher mentors has three main stages. Phases of clinical supervision used can be re-presented as shown in figure 6 and follows a three steps cycle identified as: (a) Pre-observation conference during which the TP-student and mentor work out the mode of presentation based on the lesson plan, (b) Lesson observation in which the mentor sits in class and follows the lesson, noting down key points for advice and discussion. An observation schedule is used by the mentor to write notes, and (c) Post-observation conferencing, the last phase of the cycle and this is when mentor gives the feedback to the TP-student guided by the notes made during lesson observation. Essentially the feedback focuses on the positive points, weak points and ideas not well articulated in the lesson.

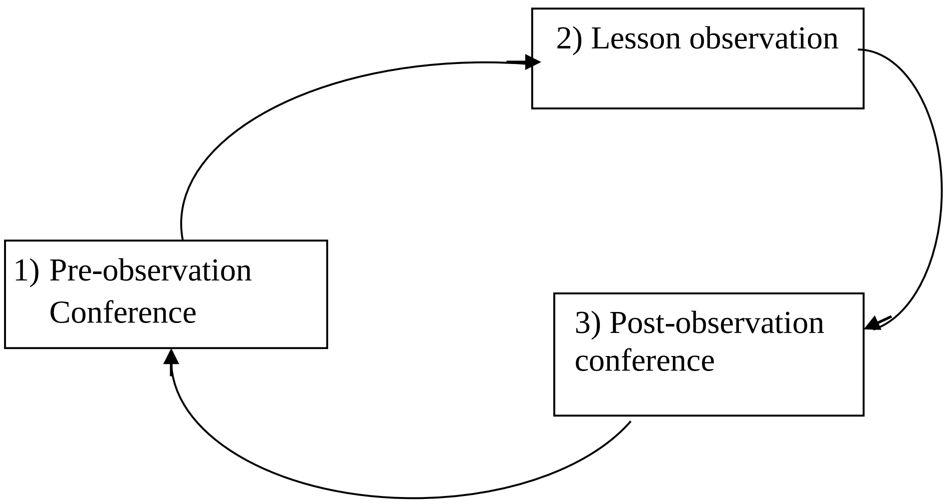


Figure 6. Phases of Clinical Supervision

Both the TP-students and the mentors had been briefed that the assessment was not for direct grading but can influence the university grade through the skills gained through mentoring experiences. The mentors had free access to university supervisor's comments and grades. Reflecting on the university supervisor's comments and grades, one mentor had this to say, *"The comments are brief and not guiding, especially in content and instruction".*

This might be due to the fact that a large number of TP students and many of the university supervisors put out for the job are not in the subject area and at times might not be in the school of education. Such supervisors are limited, though it is acknowledged that some have gained some experience through long service in TP-supervision.

Another one said, *"There is limited feedback to TP-students. University lecturers are often in a hurry as they race to cover the required number of student observations per day. As a result, they may come in the lesson late or leave early or both".*

According to her, some may not have time for post-conferencing (discussion after the lesson), which is regarded as a major component of supervision.

Yet another one commented, *"Grading by university supervisors was on the higher side."* This again could be due to the concept of "giving the benefit of the doubt." When one is not sure, compensates this by generous awards to induce the other party to satisfaction and shut out any critical comments or questions. This seemed to give the mentors the inspiration that they can in fact do a good job compared to some university supervisors.

If we were to go by the mentor impressions, it can be said that most of the mentors had high belief or confidence and expectations in their performance. This sort of satisfaction by mentors after the exercise has been associated with the firm training and experiences of mentors (Dilworth & Imig, 1995). This has implications that experienced teachers who go through a suitable training can quickly but steadily acquire skills in teacher development.

Conclusion and Recommendations

This report is based on a small-scale research on teacher mentor programme. It involved only a few teachers in schools that were within easy reach, thus ensuring effective monitoring and evaluation. The main purpose of the programme was to determine its effects; especially with respect to mentor helping beginning (TP-Teachers) teachers to acquire the main skills that can make them make entry in the profession with a strong base. The results of the programme show that there are high gains for both the mentor and mentees (TP-Teachers). Mentors reported increased professional revitalization as a result of reflections and interactions with mentees. On the other hand, the beginning teachers (TP-teachers) reported immediate feedback, motivation, less isolation and belief that teaching can be a satisfying profession.

For a successful teacher-mentoring programme, careful planning and design are very important. We found the subject–to-subject design very ideal. This design allowed a mentor to guide a new teacher (TP-teacher) in his or her subject area. This was with the belief that the greatest support to mentees was in the classroom.

Quality teaching is essential if the mission of education is to be fulfilled. Mentoring can play a critical role in improving the professional knowledge and skills that teachers need to instruct and prepare learners for the next generation. The outcome of this study encourages us to emphatically recommend that mentoring can be a viable policy option in education for developing countries especially in Africa. We are aware that teacher mentoring is widely used in developed countries and have posted encouraging gains in teacher development. It is high time developed countries came up with policies that support teacher mentoring programmes. Such programmes can be designed to suit the system of particular system of education and the school environments.

Recommendation #1

There is a need to establish an official policy on teacher mentoring in pre-service teacher training curriculum. Such a policy could to address aspects of such as outlining the roles of each participant in the mentoring process, as well as adequate training of teacher mentors and the role of school administrators. It is also recommended that school administrators should have knowledge of any new programmes that concerns teachers and instruction in general. Such awareness will put administrators in a position to plan how best to support the programme (Janas, 1996). A school administrator responsibility with respect to a teacher-mentoring programme can be several. These include:

1. Creation of a supportive school atmosphere.
2. Provision of release time: TP students and their mentors can be given enough time and opportunities to work together on a regular basis and on-going basis.
3. Development of an instructional design (Time-table) that includes a reduced workload.
4. Participation in Programme orientation, and school co-curricular activities.
5. Supervision and evaluation of the professional performance and relationship developed by mentors and teachers.

School administration should have knowledge of the teacher-mentoring programme especially in its formative stage. Both the mentors and beginning teachers need a firm support of school administration right from the principal to the head of department. It is with this realization that the research team wrote to principals to explain about the programme and seek permission and support.

Mentors in particular needed the support of administrators for successful implementation of this programme. As it is often said, giving support is a social phenomenon. Teachers are likely to appreciate support especially if it came from their superiors. Such support can boost their confidence and self-worth.

It is envisaged that the proposed teacher mentoring process can be applicable to many other developing countries.

Recommendation #2

The collaborative mentoring model (Pungur, 2007) which assumes the format outlined in figure 2 is recommended since it has the capacity to improve teacher development at the pre-service level. Findings from the study indicated that the collaborative mentoring has the capacity to improve teacher development at the pre-service level.

References

Bozeman, B., & Feeney, M. K. (2007). Toward a useful theory of mentoring: A conceptual analysis and critique. *Administration & Society* 39 (6): 719–739. doi:10.1177/0095399707304119.

Dewey, J. (1933). How we think: A restatement of the relation of reflective thinking to the educative process. Boston: D.C. Health.

Dilworth, M. E. F & Imig, D. G. (1995). Professional Teacher Development. The Eric Review, Vol. 3 No 3 pg. 5-11.

Freedman, M. & Jaffe, N. (1993): Elder Mentors: Giving schools a chance. *National Association of Secondary School Principals Bulletin.*

Gray, W. & Gray, M. (1985). Synthesis of research mentoring beginning teachers. *Educational Leadership*, Vol. 43 pg. 37-43

Hall, G.E. (1985). A stages concern approach to teacher education. Paper presented at the 69th Annual Meeting of the American Educational Research Association, Chicago, IL. March 31–April, 1985.

Janas, M. (1996). Mentoring the mentor: A challenge for staff development. Journal of Staff Development, Vol. 17 No 4 pg. 2-5.

Nguyen, T. H. (2009). An inquiry-based practicum model: What knowledge, practices, and relationships typify empowering teaching and learning experiences for student teachers, cooperating teachers and college supervisors? *Teaching and Teacher Education*, 25, 655–662.

Parsloe, E.; Wray, M. J. (2000). *Coaching and mentoring: practical methods to improve learning*. Kogan Page. ISBN 978-0-7494-3118-1.

Pungur, L. (2007). Mentoring as the key to a successful student teaching practicum: A comparative analysis. In Townsend, T. and Bates, R. (Eds): *Handbook of Teacher Education*, Springer Dordrecht: Netherlands.

Republic of Kenya, (2012). A Policy Framework for Education: *Aligning Education and Training to the Constitution of Kenya (2010) and Kenya Vision 2030 and beyond.*

Schön, D. 1983. The Reflective Practitioner. New York: Basic Books.

Schön, D. 1987. Educating the reflective practitioner. San Francisco, CA: Jossey-Bass.

Telley, D. (2002) in Helm, N. and Allin, P. (Eds): Funding support in Ministry. Cambridge; Grove Books.

Twoli N.W. (2011). Mentoring as a process of training teachers in the 21st century. Proceeding of the 2nd International Conference on Education. Kenyatta University, Kenya.

Willems, A. (1986). What are key Guidelines that ensure a Quality Teaching Experience? *Education*, Vol. 107, 192-197.

Zeichner, K. (2009). Teacher education and the struggle for social justice. New York: Routledge.

*This research was made possible by the generous support of the American people through the United States Agency for International Development (USAID) and the Higher Education for Development (HED) office, as well as the Schools of Education at Kenyatta University and Syracuse University. The contents are the responsibility of the project team members from Kenyatta University and Syracuse University and do not necessarily reflect the views of HED, USAID or the United States Government.

TEACHER'S DISTRIBUTION PATTERN AS DETERMINANTS OF EFFECTIVE TEACHING AND LEARNING IN NIGERIA SECONDARY SCHOOLS

Ogunlade J. Olurotimi
Islamic University, Uganda
Obote2011@yahoo.com

Adeleye J. Olusola
Ikere Ekiti University

Scholastica Ekere
University of Calabar, Nigeria

The study investigated teacher's demographic factors to ascertain teaching learning issues in Nigeria. As a descriptive survey, teachers and students in senior secondary schools in Ekiti State constituted the study population. The sample comprised of 288 teachers and 1920 students, randomly selected from 32 schools that were stratified, selected and drawn from 16 local government areas in Ekiti State. Four different measuring instruments were used to collect data. The data collected were subjected to statistical analysis using t-test. Findings from the documentary evidence revealed there is uneven distribution of teachers between sex and location, while statistical calculation results revealed that there is a difference between the effectiveness of male and female teachers as well as teachers from both urban and rural locations in the improvement of teaching and learning. The study recommended that government should do more to monitor implementation stages of its education policy with special regard to gender and locations of teachers. Serious and genuine implementation of policy is as important as its formulation. The inspectorate division of the ministry of education should take seriously the distribution of teachers and monitoring of what goes on in our classrooms, especially schools in rural areas where students expect "miracle" passes.

Keywords: Teacher, Distribution, Determinants, Effectiveness, Teaching and Learning

Introduction

The quest to improve teaching and learning has become the center stage issue in education. There has been more and more interest in recent years in an international perspective on how children achieve and on the factors that promote their achievement in different societies. In Nigeria the issue of Teaching effectiveness has become crucial, ubiquitous, and recurring in educational discourse which requires a teacher who is characterized by high knowledge of content, context, pedagogy and personal discipline (Clark and Walsh, 2002). Ogunnu (2000) opines that the success of teaching effectiveness is dependent on teacher's personal attributes evident in his or her standard of impeccable ethical and social conduct. There can be no effective learning without the teacher. "The teacher is the pivot round which the agencies of education operate". In the present day Nigeria, teachers duties apart from teaching, include; administration, leadership, counseling and implementation of government policies (Egbule and Ewunyenga, 2000:3). Teachers are the main actors in the implementation of education programmes. The achievement of objectives of any educational programme depends largely on the quality and quantity of teachers in secondary schools.

Teaching effectiveness improvement should be high on the agenda of any nation's educational policies. It is strongly focusing on student outcomes, the characteristics of the schools and classrooms. Thus, it looks at what needs to be changed in school in order to become more effective. Teaching effectiveness recognizes that teacher 'effects' such as teacher behaviors, classroom climate and pupils/teachers interaction are four to five times more important than school effects (Creemers, 1994). For teaching to be effective the outcome of such schools must tend to be excellent; student must have access to their teachers, the school goal must be defined and achievable. Government policies must be well formulated to guide the focus of the nation's educational development. Parents as representatives of the community are needed to be involved during the setting and implementation of these policies.

Certain factors affect teaching effectiveness in schools. These include; gender, social status, qualification, area of specialization, government policy, location, cultural and religious belief (Oghuvbu, 2007 Okoro, 2005). It is a common practice that married female teachers serve in their husband stations. This affects teaching effectiveness of teachers. Rural schools suffer more from this gender influence on teachers effectiveness, (Ikoya, 2008), since most married women serve in urban schools. Parents complain of poor quality instruction especially in rural schools. Qualitative instruction resulting into qualitative education can only be achieved through effective teaching from available teachers. On the influence of gender, Dee (2005) found that gender interactions between teachers and students have significant effects on students' achievement. However, the studies of Holmlund and Sund (2005) and Tymms (2005) found that teachers' gender has no effect on students' outcome. Consequently, there is no consensus in the literature on the influence of gender on teaching effectiveness.

Statement of the Problem

In spite of the concerted efforts of the Ministry of Education in posting and periodic transferring of teachers from one place to the other to ensure that there is fair distribution of teachers across the state to enhance a substantial improvement in school effectiveness with special reference to teaching and learning, it is on record that many secondary schools are seriously facing the problems of having no teachers or not inadequate especially in the rural schools, whereas in urban schools there are traces of over concentration of teachers mostly females (Adu, 2010). This has generated a lot of complaints from different spheres of stakeholders in education such as parents, community leaders, even students. Specifically this study investigated the effect of gender and location of teachers on their teaching effectiveness.

Hypotheses

Based on the problem of this study, the following research questions and hypotheses were raised:

1. Research Question 1: Are teachers equally distributed among the senatorial district according to number of schools?
2. Question 2: Are there more male than female teachers in rural schools?

a. Ho_1: there is no significant difference between the teaching effectiveness of Male and female teachers.
b. Ho2: there is no significant difference between the teaching effectiveness of teachers in Urban and rural locations.

Methodology

The researchers employed ex-post-facto and descriptive research designs of survey type. It is an expo-facto because there was no manipulation of variables but a study of independent factors as they influenced or affected effectiveness issues in schools and among teachers in Ekiti State. The population for the study consisted of all the secondary school students and teachers in Ekiti State. The state has 16 local government areas. Using stratified random sampling technique, two schools were randomly selected from each stratum (local government area) to give a total of 32 schools, the totals of 288 teachers were drawn from the 32 schools. This number was made up of 9 teachers from each school in which 3 teachers each were drawn from the departments of sciences, arts and business. Also, 60 students were randomly selected from each school from ss1, ss2 and ss3 to give a total of 1920 students. Hence, the study involved 288 teachers, and 1920 senior secondary school students drawn from 32 secondary schools. The instrument used was a self-constructed questionnaire entitled Teaching Effectiveness Questionnaire (TEQ). The questionnaire was subjected to validity with the help of experts in the areas of educational psychology and educational evaluation. The instrument was subjected to face contents and construct validity The reliability of the instrument was estimated using Cronbach alpha to ensure internal consistency. The reliability coefficients obtained was TEQ= 0.92, data on students' academic performance were collected from the results of secondary school students in their West African School Certificates Examination (WASCE) covering a period of five academic sessions, 2007/2008 to 2010/2011. Responses of students from sampled schools and their teachers and heads of schools to questionnaire items were collected and scores were assigned to each point on the likert-scale as follows: strongly agree = 4, agree = 3, disagree = 2, strongly disagree = 1, data were analyzed using inferential statistics such as t-t test, was used.

Results

Research Question 1: Are teachers equally distributed among the senatorial district according to number of schools?

Table 1: Distribution of Schools and Teachers According to Senatorial District.

S/N	Senatorial Dis. Ekiti	No. of L. G. A	No. of Schools	No. of Teachers		Total	Gender (Ratio) Relative Freq (%)		Average No. Per Sch Teacher per Sch.
				Male	Female		Male	Female	
1	North	5	145	2160	1878	4038	5 0.53 (53%)	5 0.47 (47%)	28
2	Central	5	147	1862	2920	4782	4 0.39 (39%)	6 0.61 (61%)	33
3	South	6	95	970	1350	2320	4 0.42 (42%)	6 0.58 (58%)	24
	Total	16	387	4992	6148	11,140	4 0.45 (45%)	6 0.55 (55%)	29

Source: Ministry of Education

From Table 1, female teachers (55%) are more than male teachers (45%) in Ekiti State. Senatorial analysis also showed more female teachers in Central (61%), South (58%) while North more male (53%). Average number of teachers per school is highest in Central (33), with more urban schools, followed by North (28) and South (24). This showed that location influence distribution of teachers i.e. more teachers especially female are posted to urban schools. Also table 1 revealed that teachers are not equally distributed among the three senatorial district using average number of teachers per school. There are more teachers in central senatorial district with equal number of school with North Senatorial district. This may be as a result of the Central being the administrative head (State Headquarters), teacher students' ratio and concentration of female teacher in urban schools.

H_{01}: there is no significant difference between the teaching effectiveness of Male and female teachers.

In testing hypothesis 1, data were collected using Teaching Effectiveness Questionnaire. Results were analyzed on the bases of sex (male and female) and results are presented in table 1:

Table 1: Difference in Measures of T Effectiveness in Terms of Sex of Teacher

Effectiveness		N	$\bar{X}$	SD	Df	t_{call}	t_{cr}
Sex	Male	132	65.22	5.61	286	12.52	1.96
	Female	156	57.48	4.73			

Table 1 shows measures of differences in teachers 'effectiveness when sex of teachers was put into consideration. The table shows that there was a significant difference between male and female teachers effectiveness. The calculated t-value of 12.52 is greater than the critical t- value of 1.96 at 0.05 level of significance Hence the null hypothesis that states that there are no significant differences between the effectiveness of male and females teachers is rejected in favor of alternative hypothesis.

Question 2: Are there more male than female teachers in rural schools?

Table 2: Distribution of Teachers according to School Location

School Location/Sex	Male		Female		Total	
	No.	%	No.	%	No.	%
Rural	2832	57.4	2105	42.6	4937	45
Urban	2160	35.3	4043	66.2	6103	55.3
	4992	45.2	6148	55.6	11040	100

Source: Ministry of Education

From Table 2, percentage of male teachers (57.4%) in rural schools is more than female teachers (42.6%) considering number of teachers posted to rural schools. The overall percentage of teachers teaching in rural schools (45%) is less than those serving in urban schools. Only (35.3%) male teachers compared to (66.2%) female teachers are serving in urban schools. This showed that gender affects the distribution of teachers in secondary schools in Ekiti State.

H_{02}: there is no significant difference between the teaching effectiveness of teachers in Urban and Rural location.

In testing hypothesis 2, data were collected using Teaching Effectiveness Questionnaire. Results were analyzed on the bases of location (urban and rural) and results are presented in Table 2:

Table 2: Difference in Measures of Effectiveness in Terms Based on Location of Teacher

Effectiveness		N	$\bar{X}$	SD	Df	t_{call}	t_{cr}
Location	Urban	168	58.64	6.48	286	15.62	1.96
	Rural	120	49.27	3.63			

Table 2 shows measures of differences in teachers 'effectiveness when locations of teachers were put into consideration. With a mean value of 58.64 for urban teacher s to 49.27 for rural teachers the calculated t- value of 15-62 is greater than the critical t-value of 1-96 at 0-05 level of significance. This gave an indication of an existence of significant differences between effectiveness of teachers in urban and rural locations. Hence the null hypothesis which states that there are no significant differences between the effectiveness of Urban and rural teachers is rejected in favor of alternative hypothesis

Discussion

It was shown in this study that there was a significant difference between male and female teachers' effectiveness. This implied that the sex of the teacher influences the level of his/her effectiveness. The result is contrary to the findings of Amit and Sorj (2012) where both male and female teachers were found to exhibit equal level of teacher effectiveness. However, the study of Ajayi (1999) showed that female teacher's job mean performance was greater than that of male teacher and that female teachers had higher level of job performance.

The difference obtained between male and female teachers' effectiveness in this present study can be due to the fact that male teachers were more committed to their teaching jobs than their female counterparts who now engage in extra business like trading during breaks and outside the classroom to earn additional money.

The findings of this research show that there was a significant difference between urban and rural teachers' effectiveness. This result agrees with those of Reuks (1992) and Abduliahi and Onasanya (2010) that senior secondary school students in urban areas had higher means in term of performance than students in semi-urban and rural areas.

Analysis of posting of teachers in this study showed that there was a high concentration of teachers in terms of numbers and sex in urban cities compared with those teachers teaching in rural areas. The study revealed that a large number of the teachers, especially females, (6148 females to 4992 males) were posted to teach in urban cities. For instance, 55 NCE female teachers were engaged in urban cities to 10 females in rural areas. This is against 32 male NCE teachers who stayed in the rural schools. Hence the ratio of teachers to students is usually low in urban areas, whereas teachers have to face large crowd of students in rural areas (Ajayi 1999).

Another possible factor can be attributed to the effect of proximity of the Ministry of Education or Education Headquarters to teachers in urban schools. Occasional surprise visits of some ministry of Education officials to those schools make the teachers in urban schools to be constantly at alert to their responsibilities.

Conclusion and Recommendation

Considering the finding of this research, the researchers are of the opinion that the falling standard of education in Nigeria in general and in Ekiti State in particular may be alleviated by government finding ways and means to enhance school and teacher effectiveness. This can be done by monitoring what goes on inside the classroom. It is imperative that parents become active participants in the education of their wards right from the formulation of government policies through planning stages, implementation of school set goals, students, behaviors, teacher s' proficiency and finally students' outcomes. The State Ministry of Education (Teaching Service Commission) backup with a law by the House of Assembly, should distribute teacher in respective of sex and social status equally between rural and urban junior secondary schools, using the number of subjects taught and offered by students.

References

Abdullahi, O. F. & Onasaniya, S.A (2010). *Effect of teacher effectiveness on Kwara State Secondary School students' achievement in Mathematics.* Medwell Journals. Scientific research publishing company. Vol. 5 issue 4p286-292.

Adu,E.T. (2010). *School-based variables and internal efficiency of colleges in Education in Nigeria*. Unpublished Ph.D Thesis of Faculty of Education.UNAD.

Ajayi I.D. (1999). Analysis of teachers'job perfonce and secondary School students' academic achievement and their relationships. African journal of educational research .Vol.5 No2.pp 85-90.

Amit Kants & Ms Rcha Sorij(2012*).Study of teacher effectiveness and occupation stress in relation to emotional intelligence among teachers at secondary school*. In jounal of History and Social sciences Volume ii No iv.

Ajayi, T. (1995) An examination for pupils withdrawal from the universal primary education (UPE) Scheme in ogun State Osu journal of educational studies 2(1),107.

Clarck, C.J and Wasch, J. (2002). Elements of a model of Effective Teachers,

Creemers, B. (1994). The effective classroom. London

Dee, T. S. 2005. "A Teacher Like Me: Does Race Ethnicity or Gender Matter*?" Understanding Teacher Quality*, 95(2): 158-165.

Holmlund, H. and Sund, K. 2005. "Is the Gender Gap in School Performance Affected by the Sex of the Teacher?" Swedish Institute for Social Research. Retrieved May 8, 2006 from www.ne.su/research/ seminars/pdf/070313_2.pdf.

Egbule, J. F. and Eqwunygenga, E. J. (2000) The Role of the Teacher in the 21st Century

Ikoya, P.O. (2008) Current Issues in Educational Management: Being a Tracing Programme organized by Delta State Universal Basic Education Board for Principals, Vice Principals and Counselor of Juniors Secondary Schools in Educational Management, Abraka. EDSERVE CONSULT (41 - 46).ry, *Journal of Teacher Education*. Vol. 2(1) 1-6.

Oghuvbu, E. P. (2007) Leadership Problems in Secondary School in Nigeria: Teachers Perspectives, *Journal of Educational Research and Policies*. Calabar. Vol. 2(3) 91 – 96

Okoro. J. (2005) Teacher Education and Professionals in the Context of Nigeria Educational System. Being a paper presented at Matriculation Ceremony of N.C.E. Programme at N.T.I. Eku Study Centre.

Ogunu, M. (2000) Introduction to Educational Management, Benin-city, Nigeria: Mabogun Publishers

Reuks Steven F (1992): Charateristics of successful schools.Perception of different between rural and urban elementary schools Teachers(ED360113)in ERIC educational research centre.

Tymms, P. 2005. "Teacher Gender has no Effect on Pupil Performance." Retrieved July 27, 2006 from http://www.teachers org.uk.

TEACHERS' PREPAREDNESS IN INTEGRATING INFORMATION COMMUNICATION TECHNOLOGIES IN PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN KENYA

Alice Omariba
Kenyatta University
aliceomariba@gmail.com

Henry O. Ayot
Kenyatta University
hoayotk@yahoo.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

This study investigated teachers' preparedness in integrating ICTs in public primary teacher training colleges in Kenya. Integration of ICTs brings revolutionary changes in teaching methodologies. The innovation lies not per se in the introduction and use of ICTs, but in its role as a contributor towards students-centered form of teaching and learning. Teachers' preparedness was measured in; types of ICTs available, teacher's training levels, teacher attitudes towards ICTs and challenges faced on ICTs integration. A descriptive survey design was used in the study which was conducted in four (4) public primary teacher training colleges in Central region of Kenya. These provided an ideal population for the study. The obtained data was analyzed systematically using descriptive statistics and presented with the help of frequency tables, figures and percentages. The study findings revealed that the types of ICTs available were inadequate; there was lack of proper training in the use of ICTs and preparedness on integration of ICTs was at an infant stage with several challenges on attempts to integration.

Key words: Preparedness, Integrating Information Communication Technology, Training

Background of the Study

The rapid growth in Information Communication technology (ICT) has brought remarkable changes in the twenty-first century especially in the education system. This is because Education in the world over has been recognized as an important means for promoting economic and social development both at individual and national levels. The growth of the global economy and the information based society has pressured education systems around the world to use technology to teach students the knowledge and skills they need (UNESCO, 2012; Morawacynski & Ngwenyama, 2007). Integration of ICTs brings revolutionary changes in teaching methodologies. The innovation lies not per se in the introduction and use of ICTs, but in its role as a contributor towards students-centered form of teaching and learning (Smaldino, 2012; Ogange, 2011). It provides the tool needed by the'' information knowledge society''. Thus, teachers are inevitably presented with the demand to integrate ICTs into teaching and learning to empower learners in this digital era. ICT allows us to collaborate, create, collect, store, disseminate, knowledge and resources all over the world (Ogange, 2011; Vrasidas, Zemblyas and Glass, 2009; Traxler, 2007 and Shih and Mills, 2007). With skills in ICT becoming a necessity that individuals have to acquire, educational institutions are left with the burden to provide a conducive environment to help the learners in the pivotal roles they are going to play in the knowledge and digital economy (Zindi & Aucion, 2005).

The fast development of ICT therefore necessitates a growing demand on educational institutions to use ICT to teach the skills and knowledge learners need in the 21st century era to fit in the global job market. Realizing the effect of ICT on the workplace and everyday life, today's educational institutions try to restructure their educational curricula and classroom facilities in order to bridge the existing technology gap in teaching and learning. This restructuring process requires effective integration of technologies into the existing environment in order to provide learners with knowledge in specific subject areas to promote meaningful learning and to enhance productivity (Tomei, 2005). Teachers therefore need to embrace the integration of ICT to empower learners to robust into the global world (UNESCO, 2002). This is because teachers in many countries in the world are working with learners who are growing up with ICT as a non-remarkable feature of their world (Facer, Furlong & Sutherland, 2003); Haddad & Draxler, 2002) as many of the fundamental assumptions that guided and shaped past thinking about modes of learning are inappropriate as the world is in the 21st Century.

Global investment in ICTs to improve teaching and learning in schools have been initiated by many governments. For instance, in the United Kingdom, the government spending on Educational ICT in 2008-09 was 2.5b pounds, United States expenditure on K-12 schools and higher education institutions was $6 billion and 4.7 billion respectively (Nut, 2010) and in NewZealand, the government spends over $410 million every year on schools ICT infrastructure (Johnson, Calvert and Raggert, 2009). Despite all these investment on ICT infrastructure, equipment and professional development to improve education in many countries Gulbahar (2007) observe that huge educational investments have placed little evidence on integration of ICTs in teaching and learning. Evidence suggests that education sector is investing heavily on ICTs but its integration is yet to impact on teaching and learning which has lagged behind the business sector (Stensaker, 2007), which is a similar case to the Kenyan scenario. Several surveys are carried out to investigate factors that are related to the use of computer technology in teaching and learning by teachers (Baek, Jong and Kim, 2008; Goktas et al. 2009) however, this is not on how teachers are prepared to integrate these technologies in teaching and learning in primary teacher training which the current study sought to investigate.

By integrating ICT during regular classroom instruction, tutors demonstrate to the student teacher trainees the innovative ways of teaching and learning (Steketee, 2006). Countries like United States, Australia, Japan, Malaysia and Philippines have ongoing initiatives on ICT integration in education (Nut, 2010). Some have even created competency standards for technological use as observed by Bitter & Pierson (2005). However, integrating ICT in education is a complex process of educational change and the extent of integration in many countries Kenya inclusive; is extremely varied and in most cases very limited (Goktas et al., 2009; Orlando, 2009; Stensaker, 2007; Warwick and Swaffield, 2006).

The challenge in integration of ICT in teaching and learning has been the lack of technical support (Gode, 2013). The availability of technical support in institutions means the use of ICT in teaching without losing time especially in having to fix software and hardware problems. Computer breakdowns leads to learning interruptions and without computer technicians who can give technical assistance, it is likely that the regular repairs of the computer will not be carried out which discourages teachers to integrate computers. Other than equipment breakdown, sometimes teachers' fear of equipment failure restricts their integration. Thus, without technical support for teachers, they become frustrated resulting in their unwillingness to integrate ICT to teach (Condie et al. 2007; Gode, 2013; Muyaka, 2012).

In most parts of Africa, the purpose has been to catalyze a pattern shift towards "21st century learning" and support Education for All goals at various levels throughout the regions education system (UNESCO, 2012). However, there is no basic infrastructure to enable the integration of ICTs even to provide basic access to digital information (Ogange, 2011 & Maruti, 2010). In the present scenario, Africa is excluded from integration of ICT revolution except for a few financial and international business nodes that are in any case directly linked to global networks and completely by pass African economies and societies (Unwin, 2005). This has led to what is generally referred in ICT as the "digital divide" especially in education; a term used to denote the discrepancy between countries and people who can benefit from the progress of integrating ICT in order to develop their socio-economic structures and on the other hand those who are excluded from the process (UNESCO, 2012).

Several International agencies are now focusing their attention on the issue of the digital divide in education (UNESCO, 2005). African governments, non-governmental and corporate organizations have also started initiating projects dealing with inclusion of ICT in primary and secondary curriculum but not integrating ICT in primary teacher training curriculum. Although countries are at the beginning of using new technology, its future use in education cannot be understood (Canoy & Rhoten, 2002; Muriithi, 2005). This includes New Partnership for Africa Development (NEPAD) that focuses on ICT for e-colleges as one of its projects. Norris (2001) observes that:

> For many years, the focus of this investment was on making successive waves of new technology work in resource-poor education environments. This emphasis tended to promote a techno-centric approach to education reform. The emphases were viewed as layering new technology on top of social problems at the college level but not in pre-service primary teacher training colleges.

The dominant view seemed to be that ICT itself would catalyze the much-needed changes in the education system. Its aim is to impact ICT skills to learners in primary, secondary and colleges, harness ICT technology to improve and expand education in African countries but not in teachers training colleges (NEPAD African Commission, 2007). So far computers have not transformed teaching practices (Becker, 2000). M'umtaz (2000) urges that lack of computers and software can seriously limit what teachers can do in classroom work with regards to integration of ICT.

It is becoming evident that the present educational systems are ill equipped for meeting the challenges to meet the demands for conventional education by the populace. This necessitates alternative solutions such as seizing opportunities around us and such catalyst for change lies in the integration of ICTs as a force that will change our primary teacher training and the education system (Kennedy and McNaught, 1997). Further, the absence of large-scale roll-outs following the NEPAD e-college demonstration project and the decline of the Khanya project, Egypt's Smart College network, the JEI, College Net Namibia, World links and College Net Africa, illustrates how many ICT in education initiatives were unsustainable in spite of significant investments.

In Kenya, learning institutions are under increasing pressure to integrate ICT in teaching and learning given the knowledge and skills needed in the 21stcentury (MOEST Policy Draft, 2012). In spite of this, the challenge confronting our educational system is how to transform the curriculum, teaching and learning process to provide student teacher trainees with the skills to function effectively in this digital era (Jones, 2004). Even if after the teachers' initial anxiety of getting involved with technology has been overcome, serious challenges still remain in terms of providing enough technical support. However, teachers will not be discouraged by equipment failure that they do not understand (Tong &Trinidad, 2005).

The field of education has tried to exploit the web as a communication channel to connect distant learners with instructors (Moore & Kearsley, 2005) but Young (2002) has argued that though e-learning, learning has become an activity that is no longer set within programmed schedules and slots. It is embedded because the education systems in Africa region face endemic crises under the influence of widespread poverty, inequality, political regimes that range from dictatorships to democracies all of which toll on national education system (UNESCO, 2012). According to Omwenga (2008), integration of ICT will assist tutors to provide a variety whereas Muriithi (2005) observes that in Kenya, integration of ICT in education is still at limited stage and the NEPAD initiated pilot projects on ICT usage in

Kenya is only in primary and secondary schools. Oredo (2008) studied the framework of evaluating ICT use in primary teacher education in Kenya.

This is evident that researchers have noted that Kenyan government is keen in rolling out integration of ICT into institutions (MOE, 2005; TIVET, 2011 and Hennessy et al., 2010). At the Ministry level, the government adopted its implementation framework on ICT integration in education, which was categorized into two portions. First, efforts of ICT policy review at a cost of 6.3 billion and provision of ICT infrastructure to institutions at a cost of 7.8 billion (MOEST, 2006).

Integration of ICTs has seen the government look at the various levels of education in the country differently in terms of policy formulation and implementation. Consequently, there has been a commitment by the MOE to provide the necessary ICT infrastructure to Primary Teachers Colleges (PTCs). Strategies and initiatives to realize the commitment are many even though not harmonized into a one unified government document. Most of these can be found in a number of documents including: National ICT Policy of 2006, the National ICT Strategy for Education and Training document, Kenya Educational Sector Support Programme document, Kenya ICT Trust Fund and the 2007 revised Primary Teacher Education (PTE) ICT syllabus prepared by Kenya Institute of Education (KIE). In appreciation of the need for Public Private Partnerships (PPPs) in equipping the PTCs with ICT infrastructure, the government has had a number of collaborations such as the New Partnership for Africa Development (NEPAD) e-schools programme and the World Summit on the Information Society (WSIS) whose objective was to integrate ICT in the delivery of education curriculum (MOE, 2006). Specific targets that were to be achieved by 2015 were linking colleges with ICTs and adapting curricula to meet the challenges of the information society (MOE, 2006). An important step is an agreement to digitalize the curriculum under the KICD and NEPAD implementing connectivity to institutions (MOE, 2005). In addition, Farrell (2007) outlines specific e-learning resources that are to address the educational needs of primary and tertiary institutions.

The Kenya ICT Trust Fund was established to mobilize and provide ICT resources to facilitate education and training through integration and innovation. Its general objective is to facilitate Public Private Partnerships (PPP) to mobilize and provide ICT resources to Kenyan public schools, community resource and learning centers. Integration of ICT is well captured in Kenya's Visio 2030(Republic of Kenya, 2007). Kenya Vision 2030 wishes to see Kenya embrace technology and produce citizens that have skill and levels that are globally competitive (Rotich, 2013). The same is highlighted in the Kenya Constitution 2010 article numbers 43, 53, 54, 55 and 56. The Kenya Institute of Curriculum Development (KICD) have developed an online teacher orientation courses using Elimika Learning Management Systems (LMS) whose main aim is to increase access to information on issues relating to the curriculum and curriculum delivery (Kenya Institute of Education, 2011). However, there are no clear guides on how integration of should done and whether teachers are prepared to integrate ICTs in primary teacher training colleges to roll out the same in Kenya primary schools.

Although these initiatives were set up as early as the year 2000, they have not addressed teachers' preparedness to integrate ICTs in the Kenyan PTCs. The pertinent question one would ask at this point is; is integration of ICT benefiting both the tutors and student teacher trainees in PTCs in Kenya? This is because teachers are implored to integrate ICT into teaching and learning activities, but teachers' preparedness to integrate the technologies into teaching determines the effectiveness of the technology and not by its shear existence in the classroom (Kinuthia, 2009; Wong and Li, 2008) whereas Momanyi et al. (2006) noted that there is a gap in the ability to integrate ICT effectively in teaching and learning process in primary schools. Therefore, this study sought to establish teachers' preparedness in integrating information communication technology in teaching and learning in primary teacher training colleges in Kenya.

Methodology

The study was conducted by using a descriptive survey design. The target population comprised of both (a) tutors and (b) student teacher trainees. Proportionate sampling technique was used and Yamane formula for the sample size. Both quantitative and qualitative techniques were used to collect and analyse data.

Findings of the Study

Data were analyzed using the SPSS programme and findings reported as follows.

Types of Information Communication Technology Available

The findings of the study established the mean value of types of ICTs available therefore ranged from 1.00 – 2.00 whereby the most available ICT reported were computers with a mean of 1.01 with a standard deviation of 0.10 and text books with a mean of 1.05 with a standard deviation of 0.23.

Table 1: Types of ICTs Available in the Colleges by the Student Teacher Trainees

Type of ICT available	f (N = 297)	%	Mean	Std
Text books	281	94.6	1.05	0.23
Overhead projectors	215	72.4	1.28	0.45
Black boards	271	91.2	1.09	0.28
White boards	255	85.9	1.14	0.35
Radio	79	26.6	1.73	0.44
Television	245	82.5	1.18	0.38
LCD	109	36.7	1.63	0.48
Computers	294	99.0	1.01	0.10
Tablets	57	19.2	1.81	0.39
Mobile phones	228	76.8	1.23	0.42
Charts	143	48.1	1.52	0.50

The researchers viewed that types of ICTs available were inadequate for teaching and learning purposes. That access to the computers in colleges was poor with limited Internet connectivity even though Internet connectivity avails academic materials across the globe thus making ICT lecturers to use modems to download mapping information. Moreover, poor accessories in colleges impede use. Even the tutors with personal computers/laptops do not use them for college work. This hinders the rolling out on integration of ICT. This study concurs with Maruti (2010) study that revealed that in as much as internet connectivity is vital in promoting e-learning, teacher training colleges have very poor internet connectivity which implies that the colleges in Kenya are not prepared to reap from emerging technology to harness quality learning/education.

Further, the findings revealed that the available computer versus student teacher trainees' population leads into poor student computer ratio leading to sharing. This finding concurs with Gode (2013)'s study that established that ICT infrastructure in training colleges were not adequate. In addition, the study revealed that even the few ICTs available, there were no qualified technicians to help the tutors and student teacher trainees when ineed. This study findings concurs with Ogange (2011)'s study on an analysis of ICT policy development and practice in teacher education in Kenya which revealed the lack of ICT technological infrastructure, and Muyaka (2012)'s study on ICT infrastructure and teacher preparation in the integration of ICT in teaching and learning in primary teacher training college which established inadequate access to the few ICT infrastructure available. The researchers are justified to conclude that there is lack of preparedness on integration of ICT to teaching and learning since the ICTs available in PTTCs are inadequate.

Extent to Which Tutors Integrated Some Specific ICTs

The study findings revealed that most of the computers available were not functional, tutors were not competent in integration as they were not fully trained on computer and other ICTs, some had left integration to the ICT department, some tutors were not computer literate at all, tutors noted they lacked time to practice yet their departments had only one computer whereas the classrooms were not ICT friendly to enhance integration.

Table 2: How Often the Tutors Use Computers and Other ICT Tools to Present a Lesson

	Every time	**Once a week**	**Once a month**	**Once a year**	**Never**
Number of Tutors (N = 43)	10	1	4	3	25
%	23.3	2.3	9.3	7.0	58.1

Tutors' Skill Levels on Integration of ICTs

The study revealed that tutors were not competent on integration as they were not fully trained on computer and other ICTs. The rating of the skills by the tutors was based on their ability to; get information and apply in context, guide student teacher trainees to get the context well and enable the student teacher trainees be able to integrate ICTs in their teaching career.

Table 3: Tutor Rating of their Skills Levels on Integration of ICT As they Prepare Teacher Trainees

Rating of skill	**No. of tutors (N = 43)**	**%**
No skill at all	7	16.3
Fair	19	44.2
Good	15	34.9
Very good	2	4.7
Total	**43**	**100**

Preparedness of Tutors in Integrating ICTs

The study revealed that there was no significant relationship between training on use of ICTs and tutors rating on skill level on integration of ICTs as they prepare teacher trainees in their teaching career.

Table 4: Correlation Results between Tutors Training on ICT Use and Skill Level on Integration of ICTs

		Skill level on integration of ICTs to prepare teacher trainees in their teaching career	Training on ICT use
Skill level on integration of ICTs to prepare teacher trainees in their teaching career	Pearson Correlation	1	-.267
	Sig. (2-tailed)		.092
	N	43	41
Training on ICT use	Pearson Correlation	-.267	1
	Sig. (2-tailed)	.092	
	N	41	41

The negative correlation implied that those who were trained on use of ICTs tended to rate their skill as fair compared to those who were not trained. The overall statistics showed that there was no significant difference between training and the tutors rating on skill level on integration of ICTs. The study therefore views that computers have not transformed practice and that access to ICT is the foremost and necessary step in the integration process even though mere access will not automatically lead to integration of ICT for teaching and learning. The study established further that there was lack of proper training in the use of ICTs and that preparedness on integration is at an infant stage. Similarly, Selwyn (2007)'s study on factors influencing integration of ICT in Higher Education in Vietnam revealed that there was a poorly slow uptake of ICT in education. According to Charalambos and Glass (2005) teachers are more likely to integrate ICTs into the classroom if they have access to adequate equipment and a solid technology infrastructure.

The study viewed therefore that both the tutors and student teacher trainees were not prepared to befit from integration of ICT to harness quality learning. This concurs with Maruti (2010)'s study on e-readiness. Moreover, the training programme does not currently provide prospective student teacher trainees with the necessary skills, competencies and experiences to prepare them to integrate ICTs effectively in their teaching profession. The study concurs Mukiri (2012)'s study which revealed that teachers lacked proper training in the use of ICT as they were not exposed in the use of ICT as a teaching resource in teaching in their teaching career despite the fact they had ICT qualifications which does not help them in lesson delivery.

The study also concurs with Duran (2000)'s study on preparing technology- proficient teachers. Further, the study also concurs with Muyaka's (2012) study which revealed that student teacher trainees lacked an allocated time within the college timetable when they could freely access computer labs to enforce practice as they were expected to have free time when they could access the facilities and put to practice what they had learned if integration of ICTs has to be realized in Kenyan PTTCs. According to Bowes (2003), to use these tools effectively and efficiently, teachers need visions of technologies' potential, opportunities to apply them, training, and just-in-time support and time to experiment only can then teachers be informed and confident in their use of ICTs whereas Collins and Jung (2003) observe ICT can be used as a core or complementary to the teacher training process if integration has to be realized.

Challenges Faced by Student Teacher Trainees while Integrating ICT into the Curriculum

The findings of the study revealed a myriad of challenges among which included: inadequate facilities, lack of competence, knowledge and skills in ICT integrations, limited time for accessing the computer in the college, Power blackout, lack of support from college administration and government, college systems do not embrace integration in all subjects, inadequate training, lack of enough ICTs and negative attitude of students, low levels of ICT literacy among tutors especially on use of modern ICTs, lack of appropriate and relevant content from publishers and the ministry, apathy on usage of ICT in teaching learning process, some tutorial ignore using the ICT facilities available and initial preparation time is too long. These findings concurs earlier studies on ICT infrastructure in PTTCs (Farrell, 2007 and Hennessy et al.2010). Muyaka (2013) observes that it is evident that the presence or absence of ICT infrastructure is becoming a crucial factor in teachers' decision to use ICT in teaching. According to Gomes (2005), lack of technical support on integration affects to a great extent the use of ICTs in teaching whereas Gutterman et al. (2009) notes that lack of quality teachers to apply ICT to the existing education systems to poor policy framework for integration of ICT. Tong and Trinidad (2010) observes that without technical support for teachers, they become frustrated resulting in their unwillingness to integrate ICT to teach.

Conclusion and Recommendations

The main question that this study endeavored to find was an answer to the teachers' preparedness to integrate information communication technology in teaching and learning. Based on the findings of the study, this study has resulted in the following main conclusions:

Firstly, based on the findings that types of ICTs available were inadequate for teaching and learning purposes the researcher concluded that even the few ICTs available, there were no qualified technicians to help the tutors and student teacher trainees when ineed. Further, a large numbers of tutors do not access to computers and other ICT tools to enable them integrate in teaching and learning process. This implies that tutors did not have access to the Internet, which means that rolling out on integration is impeded to a large extent by inadequate facilities/infrastructure.

Secondly, that tutors in the PTTCs were either average or below average in terms of handling Computers due to little exposure with computers and computer related technologies. Provision of adequate ICTs will ensure that computer and other ICTs and training of personnel on how to use ICT thus addressing technophobia which causes tutors and student teacher trainees to fail to take up tasks that require integration of ICT. The researcher viewed therefore that both the tutors and student teacher trainees were not prepared to benefit from integration of ICT to harness quality learning.

Thirdly, given that curriculum delivery was done in classrooms, which were not ICT friendly, the study views that ICTs were to a large extent not aiding curriculum delivery in PTTCs and therefore the student teacher trainees lacked exposure on integration as they are being prepared in their teaching career.

Recommendations

The following recommendations were made based on the findings of the study.

1. The study established inadequate facilities in the colleges. The study recommends the MoEST to initiate partnership with private sectors to equip PTTCs with facilities/infrastructure such as providing ICT friendly classrooms and e-rate installation of Internet to PTTCs through partnership with private sectors to pay for the substantial costs to ensure secure and continual Internet connectivity. This will ensure

that PTTCs are supplied with an extra resource base other than books for teaching and learning. Further, PTTCs should source for partners, well-wishers, stakeholders and sponsors to finance the acquisition of more ICT facilities/infrastructure. This will ensure that the adequacy of ICTs in the colleges so as to improve their use/integration in the process of teaching and learning.

2. Kenyan PTTCs curriculum should train teacher trainees on how to use ICT in their classrooms by being engaged in the process of ICT-integrated training. Further, develop tutors' ICT skills and promote ICT-pedagogy integration in their teaching by providing ICT-based training environments where on-demand access to materials; peers, and networks of experts where expertise and advices can be obtained and active discussion can take place in relation to technology and pedagogy. (This approach of using ICT to support teachers' on-going professional development and networking can be very effective as long as organized support is provided, Pace, 1999).
3. PTTCs should establish strategies to identify strengths and weaknesses of various ICTs with a view to adapt embrace and integrate them in the process of teaching and learning.
4. Kenya Institute of Curriculum Development (KICD), the body responsible for developing curriculum materials should develop and supply the primary teacher training colleges with relevant e-content in all subject areas to ensure delivery of the curriculum is integrated with ICTs. When planning the curriculum, KICD should ensure that it is in harmony with the educational vision, the culture and context of learning. In this case the e-content should be locally manufactured to be responsive to the needs of the PTTCs and in harmony with the current syllabus. This will avoid provision of an irrelevant e-content or those that do not support the curriculum as observed in the "Tafakari Project."
5. College administration should have an ICT policy to guide tutors and student teacher trainees on integration. It should also embrace and support integration of ICT in teaching and learning.

References

Baek, Y.G., Jong, J., & Kim, B. (2008). *What makes teachers use of technology in classroom? Exploring the factors affecting facilitation of technology with a Korean Sample. Computers and Education. 50* (8), 224-234

Bitter, G., & Peirson, M. (2005). *Using technology in the classroom.* (6th ed). USA Person Education Inc

Duran, M. (2000). Preparing technology-proficient teachers: In C. Crawford et al.(eds), *Proceedings of society for Information Technology and Teacher Education. International Conference.* 2000, 1343-1348, Chesapeake, VA: AACE

Farrell, G. (2007). *Survey of ICT and Education in Africa: Kenya Country Report*. Washington, DC: World Bank.

Gode, V. O. (2013). Factors Influencing Integratison of Information and Communication Technologies in Public Primary Teacher Training in Central Region of Kenya. Unpublished Master's Thesis- Kisii University

Goktas, Y., Yildirim, S., & Yildirim,Z(2009).Main Barriers and possible enablers of ICTs Integration into Pre-service teacher education programs. *Educational Technology and society, 12*(1)93-204

Gupta, J. J.(2006). *Fundamentals of Statistics.* Himalaya publishers, Himalaya

Gutterman, B., Rahman, S., Supelano, J., Laura, T. & Mai, Y. (2009*). Global Alliance for ICT and Development*: New York.

Hermans, R., Tondeur, J., van Braak, J., &Vackle, M. (2008). *The Impact of Primary School Teacher's Educational Beliefs on the Classroom Use of Computers and Education, 51*(4), 1499-1509

Judson, E. (2006). How teachers integrate technology and their beliefs about learning: Is there connections? *Journal of Technology and Teacher Education.* 14,581-597

Kirschner, P., & Selinger, M (2003). The state of affairs of teacher education with respect to information and communication technology. Technology, Pedagogy and Education 12, 5-17

MOE Strategic Plan 2006-2011. Nairobi. Teachers Service Commission.

MOEST, (2005). *Kenya ICT Education and Option Paper of 2005*. Nairobi Momanyi, L., Norby, R., & Strand, S. (2006). The need for integration of technology in k.12 School settings in Kenya, Africa NACE Journal 14 (2), 154-177

Mukiri, I. M.(2012). Preparedness of Mathematics teachers for teaching Mathematics using ICT in secondary schools on Tigania East District, Kenya. A paper presented in the 3rd International Conference held in Kenyatta University, July 10th to 12th, 2013

Mumtaz, S. (2000). Factors Affecting Teachers' Use of Information and CommunicationsTechnology: a review of the literature. *Journal of Information Technology for Teacher Education,9(3), 319-342*

Murithi, P. (2005). A Framework for Intergrating ICT in the Teaching and Learning process in Secondary schools: school of computing and informatics, University of Nairobi

Muyaka, J. (2012). ICT Infrastructure and Teacher Preparedness in Integration of ICT in Teaching and Learning in primary teachers colleges. A paper presented in the 3rd International Conference held in Kenyatta University, July 10th to 12th, 2013

Noris, P. (2001). Digital divide. Civic Engagement, Information Poverty and the Internet Worldwide. Cambridge University Press.

Ogange, B.O.(2011).An Analysis of ICT Policy Development and Practice in Teacher Education in Kenya between 1997-2007

Omwenga, I.E. (2008). Pedagogic Issues and E-learning Cases: Intergrating ICT's into teaching learning process. School of computing informatics. University of Nairobi, Journal paper (Internet Material

Orlando,J.(2009).Understanding Changes in teachers' ICT practices: a longitudinal Perspective, Technology, Pedagogy and Education,18:1,33-44

Oredo, J. O. (2008). A Framework for Evaluating ICT Uses in Teacher Education: A Case Study of the Primary Teacher Training Colleges in Kenya. Strathmore University, Kenya

Rotich, G. (2013). Effects of e-learning system on teacher orientation program: A case study of Kenya Institute of Education. Unpublished Master's thesis-Kisii University

Shih,Y.E., & Mills,D.(2007).Setting the New Standard with Mobile Computing in Online Learning. International Review of Research on Open and Distance Learning.8,no(2)

Smaldino, S. E., Lowther, D. L. & Russell, J. D. (2012). Instructional Technology and Media for Learning. Tenth Edition. Pearson, Boston

Stensaker, B. et al.(2007). Se, Updating and Integrating ICT in higher education: Linking Purpose, people and Pedagogy. Higher Education 54:417-443

TIVET ICT Baseline Survey Report. (2011). *Tivet Institutions Kenya*. MOEST, Nairobi.

Tomei, L.A.(2005).Taxonomy for the technology domains. Information Science Publishing, USA

Tong, K.P., & Trinidad, S.G.(2005). Constraints and Conditions of Sustainable Innovative Pedagogical Practices using Technology. *Journal of International Electronic for leadership in learning, 9*(3), 1-27

Traxler, J. (2007).Defining, discussing and evaluating mobile learning: The moving finger writes and having writ…International Review of Research in Open and Distance Learning 8(2).

UNESCO (2002). Information and communication technologies in teacher education: a planning guide. France (Paris) UNESCO. (2005). Towards the knowledge society. UNESCO World Report. Paris UNESCO

Waits, B. and Demana, F. (1990). "Enhancing Mathematics Teaching and Learning Through Technology." In. T.Cool (ed) Teaching and Learning Mathematics in the 1990s. Reson (VA): NCTM

Wong,E.M.L. and Li, S.C(2008).Framing ICT Implementation in context of Educational Change: a multilevel analysis. School Effectiveness and School Improvement 19(1) 99-120

Zindi, F., & Aucion. R. (2005). Information and communication technology (ICT): a compulsory subject for all students in teacher training institutions.

Bowes, J. (2003). *The emerging repertoire demanded of teachers of the future: Surviving the transition*. Retrieved, September 1, 2004, from http:// crpit.com/confpapers/CRPITV23 Bowes.pdf

Carlson, S., & Gadio, C. T. (2002). Teacher professional development in the use of technology. In W.D Haddad & Draxler (Eds), *Technologies for education: potential, and prospects.* Paris and Washington. D.C. Retrieved from http://www.schoolnetafrica.net/fileadmin/resources/Teacher_Professional_Deveopment_In_the_use_of_Technology.pdf

Haddad, W.D., & Draxler (Eds) (2002). Technologies for Education: Potential, Parameters, and Prospects. UNESCO, Paris, retrieved on April 25th, 2005 from http://www.schoolnetafrica.net/fileadmin/resources/Teacher_Professional_Development_In_the_use_of_Technology.pdf

Johnson, M., Calvert, E., & Raggert, N.(2009). ICT in schools. Final Report. Retrieved Nov.12,2011 from http://www.2020.org.nz/template/ict09online_final_.pdf

Maruti, J. S. (2010). E-Learning Among Public Primary Teacher Training Colleges in Kenya. http://www.kenet.org.ke/e-readness

Morawaczynski, O., & Ngwanyama, O. (2007). Unraveling the impact of Investment in
ICT in Education and Health of development: An analysis of archival data of West Africa Countries using Regression Spiner Electronic journal of Information Systems in developing countries, 29,5.1-5
Moore, M., & Kearsely, G. (2005). *Distance Education: A Systems View* (2nd ed.). Thomson/Wadsworth. Accessed: 6th April 2011 from: https://idea-group.com Nut, J. (2010). Professional educators and the evolving role of ICT in schools: Perspective Report. Retrieved Nov.12, 2011 from http://ictliteracy.info/rf.pdf/ICTinschools.pdf
UNESCO (2012). UNESCO Working Paper Series.

PERSPECTIVES ON TUTORS' PREPAREDNESS AND ADOPTION OF ICT IN PUBLIC TEACHER TRAINING COLLEGES IN KENYA

Alice Omariba
Kenyatta University
aliceomariba@gmail.com

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Henry O. Ayot
Kenyatta University
hoayotk@yahoo.com

This study was concerned with perspectives on tutors' preparedness and adoption of ICTs in public teacher training colleges. The rationale was based on the view that properly designed, learning materials inspired by integration of ICT and delivered by technology add value to a teaching environment on which contact hours are limited. The curriculum needs academic standards and the development of digital age skill for the 21st century learners if vision 2030 and beyond education goals have to be realized. The study findings revealed that preparedness on integration of ICT was at an infant stage. Adoption on integration of ICT by tutors into their instructional process was not significantly related to their years of teaching experience, there was no significant relationship between the tutors' attitude towards integrating ICT and tutors faced several challenges in an attempt to integrate ICTs into the curriculum.

Keywords: Preparedness, Integration, Adoption, Information Communication Technologies

Background to the Study

The introduction of information communication technology into the curriculum mainstream has been widely expected to penetrate and transform teaching and learning. This paper examines perspectives on tutors' preparedness and adoption of ICT in public teacher training colleges in Kenya. The rationale was based on the view that properly designed, learning materials inspired by integration of ICT and delivered by technology add value to a teaching environment on which contact hours are limited. The term ICT encompasses the range of hardware (desktop and portable computers, projection technology, calculators, data-logging, and digital-recording equipment), software applications (generic software, multimedia resources), and information systems (Intranet, Internet) available in colleges. One potentially important contextual factor which shapes how technology is perceived and used by tutors is the 'community of practice' (Lave and Wenger 1991) associated with their subject. This is a social framework within which the planning, support, and evaluation of student learning takes place. Each subject area could be said to share a set of tools and resources; approaches to teaching and learning; curriculum practices; cultural values, expectations, and aims. Departments develop their own perspectives on objectives, both internal and external to the college, and they shape their actions accordingly (Firestone and Louis 1999). In England, recent educational reforms have led to departments playing a more active part in mediating between government policy and classroom practice through the development of departmental teaching policies and schemes of work that is detailed plans for delivering the new concept. The indirect effect of the reforms has, thereby, been to increase collegiality within subject departments (Cooper and McIntyre 1996, Donnelly 2000). Their sharing of practice and experience will encompass the introduction and integration of ICT into subject teaching (Williams et al. 2000, Rogers 2002).

However, subject specialization at either level is inevitably a focus to ongoing redefinition and adoption. They are responsive to conflict, challenges, and dilemmas. The subject practice—here, tutors' knowledge, understanding, skills, attitudes, goals, beliefs, and pedagogy—thereby develops over time (Loveless et al. 2001). This complex process is not automatically triggered by adoption ICT or sharing information with colleagues. It entails developing ideas and trying them out, considering the principles and purposes that support activities in particular contexts, and critical reflection.

Little research has analyzed perspectives on tutors' preparedness and adoption of ICT integration in teacher training colleges. A Canadian investigation by Goodson and Mangan (1995) and a British study by Selwyn (1999a) offer notable exceptions. Goodson and Mangan excluded the core subjects and focused on teaching styles and classroom organization. The main issue they identified around introducing classroom computers was that of 'congruence'. Teachers are considered to be reluctant to adopt a technology that seems incompatible with the norms of an antecedent sub-culture. Andrews (2000) claims that 'the subversive, humanities-based, liberal and book-dominated culture of English … is undoubtedly a factor in the resistance of English teachers to new technologies'.

The fast development of ICT necessitates a growing demand on educational institutions to use ICT to teach the skills and knowledge learners need in the 21st century era to fit in the global job market. Realizing the effect of ICT on the workplace and everyday life, today's educational institutions try to restructure their educational curricula and classroom facilities in order to bridge the existing technology gap in teaching and learning. This restructuring process requires effective integration of technologies into the existing environment in order to provide learners with knowledge in specific subject areas to promote meaningful learning and to enhance productivity (Tomei, 2005). Tutors therefore need to embrace the integration of ICT to empower learners to robust into the global world (UNESCO, 2002).This is because teachers in many countries in the world are working with learners who are growing up with ICT as a non-remarkable feature of their world (Facer, Furlong & Sutherland, 2003); Haddad & Draxler, 2002) as many of the fundamental assumptions that guided and shaped past thinking about modes of learning are inappropriate as the world is in the 21st Century.

Global investment in ICT to improve teaching and learning in schools have been initiated by many governments. For instance, in the United Kingdom, the government spending on Educational ICT in 2008-09 was 2.5b pounds, United States expenditure on K-12 schools and higher education institutions was $6 billion and 4.7 billion respectively (Nut, 2010) and in Newzealand, the government spends over $410 million every year on schools ICT infrastructure (Johnson, Calvert and Raggert, 2009). Despite all these investment on ICT infrastructure, equipment and professional development to improve education in many countries, Gulbahar (2007) observe that huge educational investments have placed little evidence of ICT integration and use in teaching and learning especially in Turkey. Evidence suggests that education sector is investing heavily on ICT but its integration is yet to impact on teaching and learning which has lagged behind the business sector (Stensaker, 2007), which is a similar case to the Kenyan scenario. Several surveys are carried out to investigate factors that are related to the use of computer technology in teaching and learning by teachers (Baek, Jong and Kim, 2008; Goktas et al., 2009) however, this is not on perspectives on tutors' preparedness and adoption to integrate ICT in primary teacher training which the current study sought to investigate.

According to UNESCO (2012), a wide range of educational ICT interventions initiated at institutional, provincial, national, regional and global level focuses on the enabling role of ICT in improving the quality of teaching and learning, expanding access to learning opportunities, promoting social equity in education and building inclusive "Knowledge Societies" across Africa and Middle East region. Moreover, the Teacher Education for Sub-Saharan African (TESSA) is a programme that creates open multimedia resources for Sub-Saharan African teachers and teacher educators. To date TESSA has introduced a BBC radio programme that debates the role of teachers in improving quality primary education and produced a tool kit for educators and planners on designing open and distance learning for teachers in Sub-Sahara Africa.

Integration of ICT brings revolutionary changes in teaching methodologies. The innovation lies not per se in the introduction and use of ICT, but in its role as a contributor towards students-centered form of teaching and learning (Smaldino, 2012; Ogange, 2011). In addition, it provides the tool needed by the'' information knowledge society''. Thus, teachers are inevitably presented with the demand to integrate ICT into teaching and learning to empower learners in this digital era. ICT allows us to collaborate, create, collect, store, disseminate, knowledge and resources all over the world (Ogange, 2011; Vrasidas, Zemblyas and Glass, 2009; Traxler, 2007 and Shih and Mills, 2007). With skills in ICT becoming a necessity that individuals have to acquire, educational institutions are left with the burden to provide a conducive environment to help the learners in the pivotal roles they are going to play in the knowledge and digital economy (Zindi & Aucion, 2005).

There is a sense of ownership for some subjects and an unfamiliarity and suspicion for others. In summary, two studies corroborate the notion that perspectives are an important influence in determining tutors' and students' use of ICT. No within-subject variation is described, although the strong likelihood of segmental differences within disciplines is acknowledged. There is also evidence that tutors choose ICT applications, activities, and approaches to fit their own perspectives on teaching and learning (Niederhauser and Stoddart 2001). Thus, pedagogic perspectives vary both within and between subject disciplines, and will influence the evolution of subject practice.

It is also notable that individuals' attitudes, confidence levels, cognitive and emotional styles, and social identities can influence their voluntary adoption in the use of ICT and this may apply to tutors as well as students. An increasing body of research indicates that gender and racial stereotyping, in particular, may not only result in inequities concerning differential access, level and nature of use, and perceived competence. These dynamics may also impact on the perspectives and adoption of subject cultures and their tendency to integrate technology, and, hence, could affect tutors' perceptions of agency and authority in working with colleagues to bring about change (Turkle 1995). It was beyond the scope of our analysis to investigate these issues, but we flag them as being of potential interest for further work.

Specifically, the study investigated how forms of digital technology are being used to carry out already familiar activities more quickly, reliably, broadly, productively, interactively, and how such use may be re-shaping these activities. In so doing, we analyze tutors' perceptions, adoption and constraining influences upon the use of ICT. This analysis culminates in a grounded model of how technology use might be successfully exploited and integrated into existing classroom practice, and how that practice is beginning to evolve. The implications for the traditional academic curriculum of introducing a powerful set of cross-curricular tools and resources were considered, along with the influences of established curriculum practice and policy upon tutors' willingness to develop new forms of activity and pedagogy.

By integrating ICT during regular classroom instruction, tutors demonstrate to the student teacher trainees the innovative ways of teaching and learning (Steketee, 2006). Countries like United States, Australia, Japan, Malaysia and Philippines have ongoing initiatives on ICT integration in education (Nut, 2010). Some have even created competency standards for technological use as observed by Bitter & Pierson (2005). However, integrating ICT in education is a complex process of educational change and the extent of integration in many countries Kenya inclusive; is extremely varied and in most cases very limited (Goktas et al., 2009; Orlando, 2009; Stensaker, 2007; Warwick and Swaffield, 2006). More and more critical voices are raised in the West and recently two observations were notably made: first there has been a disappointingly slow uptake of ICT in education even though heavy investments has taken place in improving access to technologies and improving skills of teachers and learners;

secondly there doesn't seem to have taken place an educational revolution in teaching and learning (Selwyn, 2007).

Gutterman et al. (2009) who explored practitioners' views from 26 countries on the main obstacles in implementation of ICT in schools highlighted ICT infrastructure as among the main barriers. Out of the ten barriers mentioned four were related to accessibility. These were insufficient numbers of computers, insufficient peripherals, insufficient numbers of copies of software, and insufficient simultaneous Internet access. The other related problem with ICT infrastructure has been the slowness of ICT systems, and scarcity of educational software in the school. Even in institutions where ICT facilities are available, poor choices of hardware and software and lack of consideration of what is suitable for classroom teaching are problems that still trouble many teachers (Newhouse, 2005 & Cox et. al., 2003).

The field of education has tried to exploit the web as a communication channel to connect distant learners with instructors (Moore & Kearsley, 2005) but Young (2002) has argued that though e-learning, learning has become an activity that is no longer set within programmed schedules and slots. It is embedded because the education systems in Africa region face endemic crises under the influence of widespread poverty, inequality, political regimes that range from dictatorships to democracies all of which toll on national education system (UNESCO, 2012). According to Omwenga (2008), integration of ICT will assist tutors to provide a variety whereas Muriithi (2005) observes that in Kenya, integration of ICT in education is still at limited stage and the NEPAD initiated pilot projects on ICT usage in Kenya is only in primary and secondary schools. Oredo (2008) studied the framework of evaluating ICT use in primary teacher education in Kenya. The Kenyan government is keen in rolling out integration of ICT into institutions (MOE, 2005; TIVET, 2011 and Hennessy et al., 2010). At the Ministry level, the government adopted its implementation framework on ICT integration in education, which was categorized into two portions. First, efforts of ICT policy review at a cost of 6.3 billion and provision of ICT infrastructure to institutions at a cost of 7.8 billion (MOEST, 2006).

Integration of ICTs has seen the government look at the various levels of education in the country differently in terms of policy formulation and implementation. Consequently, there has been a commitment by the MOE to provide the necessary ICT infrastructure to Primary Teachers Colleges (PTCs). Strategies and initiatives to realize the commitment are many even though not harmonized into a one unified government document. Most of these can be found in a number of documents including: National ICT Policy of 2006, the National ICT Strategy for Education and Training document, Kenya Educational Sector Support Programme document, Kenya ICT Trust Fund and the 2007 revised Primary Teacher Education (PTE) ICT syllabus prepared by Kenya Institute of Education (KIE). In appreciation of the need for Public Private Partnerships (PPPs) in equipping the PTCs with ICT infrastructure, the government has had a number of collaborations such as the New Partnership for Africa Development (NEPAD) e-schools programme and the World Summit on the Information Society (WSIS) whose objective was to integrate ICT in the delivery of education curriculum (MOE, 2006). Specific targets that were to be achieved by 2015 were linking colleges with ICTs and adapting curricula to meet the challenges of the information society (MOE, 2006).

An important step is an agreement to digitalize the curriculum under the KICD and NEPAD implementing connectivity to institutions (MOE, 2005). In addition, Farrell (2007) outlines specific e-learning resources that are to address the educational needs of primary and tertiary institutions. The Kenya ICT Trust Fund was established to mobilize and provide ICT resources to facilitate education and training through integration and innovation. Its general objective is to facilitate PPPs to mobilize and provide ICT resources to Kenyan public schools, community resource and learning centers. Integration of ICT is well captured in

Kenya's Vision 2030(Republic of Kenya, 2007). Kenya Vision 2030 wishes to see Kenya embrace technology and produce citizens that have skill and levels, which are globally competitive (Rotich, 2013). The same is highlighted in the Kenya Constitution 2010 article numbers 43, 53, 54, 55 and 56. The Kenya Institute of Curriculum Development (KICD) have developed an online teacher orientation courses using Elimika Learning Management Systems (LMS) whose main aim is to increase access to information on issues relating to the curriculum and curriculum delivery (Kenya Institute of Education, 2011). However, there are no clear guides on how integration of should done and whether teachers are prepared to integrate ICTs in primary teacher training colleges to roll out the same in Kenya primary schools.

Although these initiatives were set up as early as the year 2000 in Kenya, they have not addressed perspectives on tutors' preparedness and adoption of ICT in public primary teacher training colleges in Kenya. The pertinent question one would ask at this point is; is preparedness and adoption of ICT benefiting tutors in PTCs in Kenya? This is because tutors are implored to integrate ICT into teaching and learning activities, but perspectives on tutors' preparedness and adoption of ICT in teaching determines the effectiveness of the technology and not by its shear existence in the classroom (Kinuthia, 2009; Wong and Li, 2008). Therefore, this study sought to establish perspectives on tutors' preparedness and adoption of information communication technology in teaching and learning in primary teacher training colleges in Kenya.

Research Methodology

The study was conducted by using a descriptive survey design. The target population was tutors from public primary teacher training colleges in Central Region in Kenya. The study used proportionate sampling technique and Yamane formula to get the sample size. The findings of the study were discussed as follows.

Findings of the Study

The Relationship between the Tutors' Teaching Experience and their Adoption of Integrating ICT

It is obvious that for teaching and learning to be efficient and effective, integration of ICT is inevitable (Ogange, 2011). The findings of the study therefore revealed that the overall mean for the tutors' integration of ICT was established to be 3.09 with a standard deviation of 0.86.

Table 1: How often the Tutors Integrate ICTs to Teach

Technology (N = 43)	Every time	Once a week	Once a month	Once a year	Never
Text books	39 (90.7%)	1 (2.3%)	-	1 (2.3%)	2 (4.7%)
Overhead projector	3 (7.0%)	2 (4.7%)	2 (4.7%)	6 (14.0%)	30 (69.8%)
Black boards	39 (90.7%)	1 (2.3%)	-	-	3 (7.0%)
White boards	19 (44.2%)	5 (11.6%)	2 (4.7%)	3 (7.0%)	14 (32.5%)

Radio	-	1 (2.3%)	-	3 (7.0%)	39 (90.7%)
Television	3 (7.0%)	3 (7.0%)	2 (4.7%)	5 (11.6%)	30 (69.8%)
LCD	3 (7.0%)	4 (9.3%)	1 (2.3%)	5 (11.6%)	30 (69.8%)
Computer	9 (20.9%)	7 (16.3%)	2 (4.7%)	4 (9.3%)	21 (48.8%)
Tablets	1 (2.3%)	-	-	-	42 (97.7%)
Mobile phones	10 (23.3%)	5 (11.6%)	4 (9.3%)	5 (11.6%)	19 (45.2%)
Charts	16 (37.2%)	8 (18.6%)	4 (9.3%)	2 (4.7%)	13 (30.2%)

This implied that the tutors generally integrate ICT once a month in the likert scale for adoption of ICT. From the findings on correlation of the number of years the tutors had in teaching vis avis their adoption of integrating of ICT into their instructional process, the result gave a Pearson moment correlation value of r = 0.006, P-value = 0.967.

Table 2: A correlation Table Showing Relationship in Adoption of Integrating ICT to Tutors Experience

		Teaching experience in years	Adoption of integrating ICT into instructional process
Teaching experience in years	Pearson Correlation	1	.006
	Sig. (2-tailed)		.967
	N	43	43

This implied that, adoption of integrating ICT by tutors into their instructional process was not significantly related to their years of teaching experience. Waits and Demana (1990) observe that adoption of technology by teachers require professional development that focuses on both conceptual and pedagogical issues, on-going support in terms of ‘’intensive start-up assistance and regular follow-up activities” and a desire to change from within the profession whereas Charalambos and Glass (2005) view that an obstacle to ICT adoption is lack of teachers’ content, technology and pedagogical knowledge…teachers often fail to take advantage of what technology affords. According to Rotich (2013), provision of quality hardware is one of the factors that facilitate teachers’ adoption of technology in teaching.

Further, the study correlated the tutors teaching experience in years and how positively it influenced the use of ICTs for instructional purposes and the result showed that there was a significant relationship (r = 0.408, p-value = 0.007).

Table 3: Relationship in Teaching Experience in Years and How Positively it Influenced Use of ICTs

		Teaching experience in years	Previous teaching experience's positive influence to the use of ICTs for instructional purposes
Teaching experience in years	Pearson Correlation	1	.408(**)
	Sig. (2-tailed)		.007
	N	43	42

*** Correlation is significant at the 0.01 level (2-tailed).*

This implied that tutors who had longer experience in teaching were positively influenced in the use of ICTs in their instructional process. The researchers viewed therefore that the influence was both positive and negative. Better skilled tutors tend to use more diverse ICTs and on more regular basis than tutors who perceive lower ICT skills. This concurs with Maruti (2010)'s study on e-learning readiness among public primary teacher training colleges in Kenya. A crucial barrier to the integration of ICT is ICT competence or skills and ICT confidence. The finding is similar to Ford (2007)'s study. A very significant determinant of tutors' levels of engagement in ICT is their level of confidence in using technologies. This is why Ottenbreit-Leftwich et al.(2010) observes that technology integration is not always the best practice whereas Jones (2004) observes that age can influence the uptake of ICT for teaching. According to Cox et al. (2003), the way ICTs are used in lessons is influenced by teachers' knowledge about their subject and how ICT is related to it. College systems do not support integration of ICT by subject tutors. There is no ICT policy in colleges to give guidelines on integrating ICT.

Table 4: ICT Policy in the Colleges

College have ICT policy (N = 43)	F	%
Yes policy	19	44.2
No policy	21	48.8
No answer	3	7.0

Further, the government has not given clear guidelines on integration of ICT especially in PTTCs. This is why Ottenbret-Leftwich et al. (2010) argues that NEVER integrate technology for technology's sake. According to Olson (2000), the policy decisions and change models are highly politicized, and do not attend to culture of classroom practice and the pivotal role of the teacher effecting the change. The study established that tutors are not conversant with ICT systems being propagated by KICD. The findings concur with Gode (2013)'s study on factors influencing integration of ICT in teacher training colleges. Prensky (2001) distinguishes between ICT natives who are born in a digital world and digital immigrants who have to learn the digital language and for whom ICT will always be the second language. Further, he notes that the tutors' subject domain may influence the use of ICT.

Tutors' Attitudes Towards Integrating ICT

Teachers play an important role in the implementation of ICT into schools and their attitudes are major predictors of the utilization of technologies in instructional settings (Al-Zaidiyeen, 2010).

The findings of the study show that there was no significant relationship between the tutors attitude towards integrating ICTs in teaching their subjects. The average attitude of the tutors in the study was calculated to be 1.64 with a standard deviation of 0.21 in the scale of 1 – 2 (1 = negative, 2 = positive). Using this scale, Analysis of variance (ANOVA) was conducted on the attitude of the tutors as determined by their integration of ICTs to teach their subjects and training on use of ICT. The study revealed that; integration of text books (F = 0.204, P- value=0.893), Overhead projectors (F = 0.389, P -value = 0.815), blackboard (F = 0.045, p- value= 0.669), Radio (F = 0.382, P -value= 0.685), Television (F = 0.225, P -value=0.922), LCD (F = 0.188, P- value= 0.943), Computer (F = 0.348, P- value = 0.843), Tablets (F = 0.534, P- value = 0.471), Mobile phones (F = 0.308, P- value =0.871) and Charts (F = 2.482, P- value = 0.063). The researchers therefore viewed that integration of ICT is not related with the tutors' attitude on integration of ICT. Jones (2004) observes that one key area of teachers' attitudes towards ICT is their understanding of how it will benefit their work and their students' learning. The study also revealed that the difference between the trained and those not trained was not significant. The researchers therefore viewed that tutors have a positive attitude on ICT use even though the principals were of the view that tutors were not positive to the concept of integrating ICT in teaching and learning process.

According to Mumtaz (2000), positive attitudes encourage less technologically capable teachers to learn the skill necessary for the implementation of technology-based activities in the classroom. Teachers' perception of technology use also is affected by their belief about the way the subject content should be taught. However, Mueller et al. (2008) observe that positive attitudes towards ICT on learning will not automatically lead to the uptake of ICT integration in teaching and learning. Further, the results of the study showed that there was a significant relationship in the skill level on integration of ICTs by student teacher trainees as they were being prepared as teacher professional. It further revealed that student teacher trainees who had negative attitude towards integration of ICTs had no skill at all even though Judson (2006) observe that there is little correlation between stated beliefs and the actual practice.

Challenges Faced by Tutors while Integrating ICT

The study explored the challenges using factor analysis and through tabulation of the Eigen values, presented the findings in table 5.

Table 5: Total Variance Explained

Component	Initial Eigen values Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %
1	1.738	28.970	28.970	1.738	28.970	28.970
2	1.373	22.881	51.851	1.373	22.881	51.851
3	1.044	17.395	69.246	1.044	17.395	69.246
4	.821	13.688	82.934			
5	.606	10.096	93.030			
6	.418	6.970	100.000			

Extraction Method: Principal Component Analysis.

From Table 5, there are 6 components/factors that are challenges to integration of ICT. The variances of these factors are the Eigen values associated with each factor representing the variance explained by that particular linear component and they also explained in terms of that particular linear component (Gupta, 2006). The first few variables explain relatively large a mounts if variance and that they are also displayed in terms of the percentage variance (so factor 1 explains 28.970% of the total variance). The first few component/factors explain relatively large amounts of data whereas subsequently factors explain small amounts of variance. Each component/factor is based on correlated with Eigen value greater than 1, is considered to have a significant influence on the dependant variable. Moreover, we extract all the factors with the Eigen values greater than 1 which leave us with 3 factors.

When components were correlated, sums of squared loadings could not be added to obtain a total variance. The Eigen values associated with these three factors were displayed and the percentages of variance explained as Extraction Sum of Squares Loadings. The three factors explained relatively large amounts of variance especially factor 1 whereas the subsequent factors explained smaller amounts of variance. Rotation has the effect of optimizing the factor structure. The last cumulative percentage of variance in the rotation sums squared loading is 69.246%. This showed that the three factors were influenced up to 69.246% of challenges of integration of ICT in teaching and learning.

The findings of the study revealed a heap of challenges such as; inadequate facilities, lack of competence, knowledge and skills in ICT integrations, limited time for accessing the computer in the college, power blackout, lack of support from college administration and government, college systems do not embrace integration in all subjects, inadequate training, lack of enough ICTs and negative attitude of students, low levels of ICT literacy among tutors especially on use of modern ICTs, lack of appropriate and relevant content from publishers and the ministry, apathy on usage of ICT in teaching learning process, some tutorial ignore using the ICT facilities available and initial preparation time is too long. The finding concurs with Gode (2013) and Maruti (2010)‘s studies.

Conclusion and Recommendations

The main question that this study endeavored to answer was perspectives on tutors' preparedness and adoption of ICT in public teacher training colleges in Kenya. Based on the findings of the study, the following conclusions were made: That there was lack of training opportunities for the staff on integration of ICT in the process of teaching and learning which impedes a great deal the rolling out of integration of ICTs in the process of teaching and learning, adequacy of ICTs influences adoption of ICT in the process of teaching and learning. Integration therefore should go beyond the use of basic computer packages/skills and textbooks for delivering subject specific content and that teaching experience influence integration of ICT in the process of teaching and learning. This factor would be mitigated by policy and frequent training of tutors in teacher training Colleges on use of ICT in teaching and learning if integration of ICT has to be realized in Kenya.

Recommendations

Based on the findings of the study, the researchers recommend that:

1. PTTCs to provide tutors with regular trainings and seminars on how to integrate ICT in the teaching and learning process. The refresher courses/training be on regular basis.
2. PTTCs should adopt policies that guide them on integration of ICT in the process of teaching and learning. One of the mandatory policies to be adoption of appraisal practices to ensure that tutors are rewarded for integration of ICTs in teaching and learning process, and ensure online ICT competency for both tutors and student teacher trainees.
3. The Ministry of Education should develop an ICT policy on integration of ICTs in teaching and learning for PTTCs and ensure it is implemented to the latter.
4. The KICD should come up with clear guidelines on integration of ICTs in PTTCs together with relevant content on the same if Kenyan outputs from PTTCs have to be relevant with the demands of the global job market.

References

Baek, Y.G., Jong, J., & Kim, B. (2008). *What makes teachers use of technology in classroom? Exploring the factors affecting facilitation of technology with a Korean Sample. Computers and Education. 50* (8), 224-234

Becker, H.J. (2000). Findings from the Teaching, Leaving and Computing Survey: Is Larry Cuban Right? *Education Policy Analysis Archives, 8(51)*

Cox, M.J., Webb, M., Abbott, C., Blakeley, B.Beauchamp, J., & Rhodes, V.(2003).ICT and Pedagogy-a review of the research Literature. London: BECTA/Df ES

Facer, K., Furlong, J., Furlong , R., & Surherland, R. (2003). *Screen Play: Children and Computing in the home*. London Routledge Falmer.

Gode, V. O. (2013). Factors Influencing Integratison of Information and Communication Technologies in Public Primary Teacher Training in Central Region of Kenya. Unpublished Master's Thesis- Kisii University

Goktas, Y., Yildirim, S., & Yildirim,Z(2009).Main Barriers and possible enablers of ICTs Integration into Pre-service teacher education programs. *Educational Technology and society, 12* (1) 93-204

Gulbahar, Y. (2007). Technology Planning: A roadmap to successful technology integration in schools. *Computers and Education, 49*(4), 943-956

Gutterman, B., Rahman, S., Supelano, J., Laura, T. & Mai, Y. (2009*). Global Alliance for ICT and Development*: New York.

Hermans, R., Tondeur, J., van Braak, J., &Vackle, M. (2008). *The Impact of Primary School Teacher's Educationa Beliefs on the Classroom Use of Computers and Education, 51*(4), 1499-1509

MOE. (2005). *Session Paper Number 1 of 2005: A Policy Framework for Education, Training and Research*. Nairobi: Government Printer.

Murithi, P. (2005). A Framework for Intergrating ICT in the Teaching and Learning process in Secondary schools: school of computing and informatics, University of Nairobi

Muyaka, J. (2012). ICT Infrastructure and Teacher Preparedness in Integration of ICT in Teaching and Learning in primary teachers colleges. A paper presented in the 3rd International Conference held in Kenyatta University, July 10th to 12th, 2013

Niederhauser, D.S., & Staddart, T. (2001). Teachers' Instructional Perspective and Use of Educational Software. *Teaching and Teacher Education, (17), 15-31*

Ogange, B.O. (2011). An Analysis of ICT Policy Development and Practice in Teacher Education in Kenya between 1997-2007

Omwenga, I.E. (2008). Pedagogic Issues and E-learning Cases: Intergrating ICT's into teaching learning process. School of computing informatics. University of Nairobi, Journal paper (Internet Material
Orlando,J.(2009).Understanding Changes in teachers' ICT practices: a longitudinal Perspective, Technology, Pedagogy and Education,18:1,33-44
Oredo, J. O. (2008). A Framework for Evaluating ICT Uses in Teacher Education: A Case Study of the Primary Teacher Training Colleges in Kenya. Strathmore University, Kenya
Selwyn, N. (2007).The use of computer technology in university teaching and learning: a critical perspective. *Journal of Computer Assisted Learning, 23(2), 83-94*
Shih,Y.E., & Mills,D.(2007).Setting the New Standard with Mobile Computing in Online Learning.International Review of Research on Open and Distance Learning.8,no(2)
Smaldino, S. E., Lowther, D. L. & Russell, J. D. (2012). Instructional Technology and Media for Learning. Tenth Edition. Pearson, Boston
Stekette, C. (2006). Modelling ICT Integration in Teacher Education Courses Using
Distributed Cognition as a Framework. Australasian. *Journal of Educational Technology*, *22*(1), 126-144
Stensaker, B. et al. (2007). Se, Updating and Integrating ICT in higher education: Linking Purpose, people and Pedagogy. Higher Education 54:417-443
TIVET ICT Baseline Survey Report. (2011). *Tivet Institutions Kenya*. MOEST, Nairobi.
Tomei, L.A. (2005).Taxonomy for the technology domains. Information Science Publishing, USA
Tondeur, J., Hermans, R., van Braak, J., &Valcke, M. (2008). Exploring the Link between Teachers Educational Beliefs Profiles and Different Types of Computer Use in the Classroom. The Impact of Teacher beliefs. Computers in Human Behavior, (24), 254-253
Tondeur, J., van Keer., van Braak, J., &Valcke, M. (2008). ICT Integration in the Classroom. Challenging the Potential of a School Policy. *Computers and Education,* 51, 212-223.
Tong, K.P., & Trinidad, S.G.(2005). Constraints and Conditions of Sustainable Innovative Pedagogical Practices using Technology. *Journal of International Electronic for leadership in learning, 9*(3), 1-27
Traxler, J. (2007). Defining, discussing and evaluating mobile learning: The moving finger writes and having writ…International Review of Research in Open and Distance Learning 8(2).
UNESCO (2002). Information and communication technologies in teacher education: a planning guide. France (Paris) UNESCO
Waits, B. and Demana, F. (1990). "Enhancing Mathematics Teaching and Learning Through Technology." In. T.Cool (ed) Teaching and Learning Mathematics in the 1990s. Reson (VA): NCTM
Wong,E.M.L. and Li, S.C(2008).Framing ICT Implementation in context of Educational Change: a multilevel analysis. School Effectiveness and School Improvement 19(1)99-120
Zindi, F., & Aucion. R. (2005). Information and communication technology (ICT): a compulsory subject for all students in teacher training institutions.
Carlson, S., & Gadio, C. T. (2002). Teacher professional development in the use of technology. In W.D Haddad & Draxler (Eds), *Technologies for education: potential, and prospects.* Paris and Washington. D.C. Retrieved from http://www.schoolnetafrica.net/fileadmin/resources/Teacher_Professional_Deveopment_In_the_use_of_Technology.pdf
Johnson, M., Calvert, E., & Raggert, N.(2009). ICT in schools. Final Report. Retrieved Nov.12,2011 from http://www.2020.org.nz/template/ict09online_final_.pdf
Morawaczynski, O., & Ngwanyama, O. (2007). Unraveling the impact of Investment in ICT in Education and Health of development: An analysis of archival data of West Africa Countries using Regression Spiner Electronic journal of Information Systems in developing countries, 29,5.1-5
Nut, J. (2010). Professional educators and the evolving role of ICT in schools: Perspective Report. Retrieved Nov.12,2011 from http://ictliteracy.info/rf.pdf/ICTinschools.pdf
UNESCO (2012). UNESCO Working Paper Series. http://www.unesco.org/new/en/unesco/themes/icts/m4ed/

UNCERTAINTY REDUCTION FOR SUCCESSFUL INTERCULTURAL INTERACTION IN DADAAB REFUGEE CAMP

Lillian Kemunto Omoke
Kenyatta University
Mokeira2012@gmail.com

In this article, I set out to express that conflicts between cultures can reduce significantly if uncertainty is reduced. This uncertainty can be reduced by learning about different people's cultures and understanding why they behave the way they do. Individuals who learn about others way of life will be less involved in negative stereotyping, prejudices, discrimination and ethnocentrism all of which hurt successful intercultural interaction. Intercultural communication for successful integration should be a concern for all stakeholders in the education sector. School serves as an important socialization agent. It is therefore important to include Intercultural communication as a subject of study at all levels of schooling. Intercultural competence should be treated as a basic skill for all people. Uncertainty reduction by Berger and Calabrese (1975) will be used to qualify that uncertainty reduction is key to intercultural communication.

Keywords: Uncertainty Reduction, Intercultural Competence, Intercultural Communication, Stereotyping, Discrimination, Prejudice, Ethnocentrism.

Introduction

Dadaab Refugee camp houses refugees from Somalia, Congo and Ethiopia. There are also humanitarian workers from different parts of the world. This means that there is likely to be a clash of cultures. Besides the humanitarian rehabilitation, there are schools from Primary, Secondary and tertiary levels. It is therefore key to point out that at the school level, successful intercultural communication can be enabled when teachers and learners from diverse backgrounds interact. For successful intercultural interaction, communicators must realize that there are needs that necessitate intercultural communication. This paper begins by enumerating these needs, which are referred to as 'imperatives for intercultural competence.'

Imperatives for Intercultural Competence

Lustig and Koester (2006) elaborate on imperative for cultural competence as follows.

The demographic imperative for intercultural communication. The world is currently in the midst of what is perhaps the largest and most extensive wave of cultural mixing in recorded history. For example, the US population is now more than 300 million of which 66.8 per cent is European American, 14.8 percent are Latino, 1.8 percent is African American, 4.6 percent are Asian American and 1.0 percent is Native Americans. The USA is not alone in the worldwide transformation into multicultural societies throughout Europe, Asia, Africa, South American and the Middle East, there is an increasing pattern of cross-boarder movement that is both changing the distribution of people around the globe and intensifying the political and social tension that accompany such populations shifts. In Dadaab Refugee camp, you will find almost all races there: Europeans, Africans, Asians and Arabs. Besides the mix in races, they are also members of varied religions mostly Christians and Muslims. This demographic imperative requires a heightened emphasis on intercultural competence.

The technological imperative of intercultural communication. Marshall McLuhan coined the term 'global village' to describe the consequences of the mass media's ability to bring events from the far reaches of the globe into people's homes; thus shrinking the world. Today, the 'global village' is an image that is used to describe the world wide web of interconnections that modern technologies have created. Communication media such as the Internet, communication satellites and call phones virtually instantaneous links to people who are thousands miles away. Many transportation systems contribute to the creation of the global village. The multicultural make-up of the major cities demonstrates that the movement of people from one country and culture has become commonplace.

Modern information technologies allow people throughout the world to participate in the events and lives of people in other places. Many world events are experienced almost instantaneously and are no longer separated from us in time and spaces. These increased contacts which are facilitated by recent technological developments, underscore the significant interdependence that now link people to those from other cultures. Intercultural links are reinforced by the case with which people can now travel to other places.

Technology allows and facilitates human interactions across the globe and in real time. Such instantaneous communication has the potential to increase the amount of communication that occurs among people among people from different cultures, and this expansion will necessarily add to the need for greater competence. The technological imperative has increased the urgency for intercultural competence. Because of the widespread availability of technologies and long- distance transportation systems, intercultural communication competence is now as important as it has ever been. In Dadaab Refugee Camp, the refugees from Somalia and Ethiopia were a closed group with technological development; they have learned to interact with all groups of people.

The peace imperative for intercultural competence. The vision of interdependence among cultural groups throughout the world has led Robert Shutter (1990) declare that culture is the single most important global communication that humans face. The need to understand and appreciate those who differ from us has never been more important.

The incidences in Darfur, Chechnya, Zimbabwe, Central Asia, Indonesia, Middle East, Afghanistan, Venezuela, Iraq and Syria show that cultures have clashed over the right to control resources and ideologies. Likewise, the frequency of hate crimes rose dramatically. In 2002, there were almost four thousand hate crimes committed against because of their race, culture, religion or social group membership. As Stimpson has said of these ‘culture clashes,’

> …the refusal to live peacefully in pluralistic societies (has been) one of the bloodiest problems; nationally and internationally- of the 20th century. No wizard, no fairy godmother is going to make this problem disappear. And I retain a pluralistic, stubborn, utopian hope that people can talk about, through, across and around their defferences and that these exchanges will help us live together justly. (Stimpson, 1994)

Kenya has always received attacks from self-confessed jihadists. They claim to be fighting for and protecting their religion. The country has hosted refugees from many countries for ages: Rwandese, Burundians, Congolese, and South Sudanese. All these groups have coexisted peacefully with Kenyans due to their perceived commonality of religion and other elements of culture. The trouble has been with Somalis due to the religious gap between them, Kenyans and the government that sponsor the humanitarian programme that run at Dadaab refugee camp. The differences and lack of understanding had always caused animosity and suspicion. These hence called for concerted efforts to engage in intercultural communication peacefully.

The interpersonal imperative for intercultural competence. The demographic, technological, economic and peace imperatives all combine to create a world I which human interactions are dominated by culture, cultural differences, and the ability of humans to understand and interact within multiple frameworks.

These are some obvious consequences to maintaining competent interpersonal relationships in intercultural world. Such relationships will inevitably introduce doubt about others’ expectations and will reduce the certainty that specific behaviours, routines and rituals mean the same things to everyone cultural mixing implies that people will not always feel completely comfortable as they attempt to communicate in another language or as they try to talk with individuals who are not proficient in theirs. Their sense of ‘rights’ and ‘wrongs’ will be threatened when challenged by the actions of those with an alternative cultural framework. These consequences of failing to create a harmonious intercultural society include: human suffering, hatred passed on from generation to another, disruptions in people’s lives and unnecessary conflicts that sap people’s creative talents and energies and that siphon off scarce resources from other important societal needs.

Competence and Inter-cultural Communication

Cultural interpersonal communication is a worthy and often elusive goal. Interpersonal competence in intercultural interactions is an even more difficult objective to achieve, because cultural differences create dissimilar meanings and expectations that require even greater levels of communication skills. Spitzberg (1988) provides the following definition of communication competence:

> Competent communication is interaction that is perceived as effective in fulfilling certain rewarding objectives in a way that is also appropriate to the context in which the illustrations occur.

This definition provides guidance for understanding communicative and intercultural competence in several ways. A key word is ‘perceived’ because it means that competence is best determined by the people who are interacting with each other. In other words, communicative competence is a social judgment about how well a person interacts with others. That competence involves q social perception suggests that it will always be specific to the context and interpersonal relationship within which it occurs. Therefore, whereas judgments of competence are influenced by an assessment of an individual’s personal characteristics they cannot wholly determine them, because competence involves an interaction between people.

Competent interpersonal communication results in behaviours that are regarded as appropriate. That is, the actions of the communicators fit the expectations and demands of the situation. Appropriate communication means that people use the symbols they are expected to use in a given context.

Competent interpersonal communication also result in behaviours that are effective in achieving desired personal outcomes satisfaction in a relationship or the accomplishment of a specific task related goal is an example of an outcome. People might want to achieve through their communication with others.

Thus, communication competence is a social judgment that people make about others. The judgment depends on the context, the relationship between the interactants; the goals or objectives that the interactants want to achieve, and the specific verbal and non-verbal messages that are used to accomplish these goals.

This paper explores a region where intercultural competence lacked but has gradually developed. Before, different people from the cultures represented in Dadaab treated each other with suspicion, there was high uncertainty. Even though the uncertainty still exists, it’s reduced through co-operation of the cultures in education, business, humanitarian aid programmes, employment and social interactions.

Cultural Identity and Cultural Biases

Successful intercultural communication fails when there is deep cultural identity and cultural biases. This section outlines these two concepts.

Cultural identity. As part of socialization, children learn to view themselves as members of a particular group. Children in all cultures, for example, are taught to identify with their families as a child becomes a teenager, and then an adult, the development of vocational and avocational interests creates new groups with which to identify. Another feature of socialization is that people are taught about groups to which they do not belong, and they often learn that certain groups should be avoided. This tendency to identify as a member of some groups called in-groups and to distinguish these in groups from out groups is so prevalent in human thinking that it has been described as a universal human tendency. (Brewer & Campbell, 1996, in Lustig & Koester, 2006).

Cultural identities are central to a person's sense of self like gender and race. One's culture is more 'basic' because it is broadly influential and is linked to a great number of other aspects of one's elf concept. These core aspects of one's identity are likely to be important in most of their interaction with others.

Because cultural identities are dynamic, one's cultural identity exists within a changing social context. Consequently, the identity is not static, fixed and enduring; rather, it is dynamic and changes with one's ongoing life experiences. In even a brief encounter with people whose cultural backgrounds differ from one's own, their sense of who they are at that instance may well be altered at least in some small ways. Over time, as you adapt to various intercultural challenges, your cultural identity may be transformed into one that is substantially different from what is used to be (Koester & Lustig, 2006).

Given our increasingly multicultural world, in which people from many cultures exist, the multifaceted characteristics of cultural identity become more important. For example, inhabitants of Dadaab Refugee camp can view themselves as workers, donor aid agents and students, Muslims, Christians among other identities.

Cultural biases. Culture is a learned set of shared interpretations about beliefs, values, norms and social practices that affect the behaviour of a relatively large group of people. Culture really exists in the minds of people, but that the consequences of culture - the shared interpretations-can be seen in people's communication behaviours. Shared interpretations provide guidelines about how people should behave and they indicate what to expect from interactions with others. In other words, a culture's shared interpretations create predictability and stability in people's lives. Cultural similarity allows people to reduce uncertainties and to know what to expect when interacting with others. This is highly recommended for Dadaab's case.

Intercultural communication means that people are interacting with at least one culturally different person. Consequently, the sense of security, comfort and predictability that characterizes communication with culturally similar people is lost. The greater the degree of inter-cultureness, the greater the loss of predictability and certainty. Assurance about the accuracy of interpretations of verbal and non-verbal messages are lost.

Terms that are often used when communicating with culturally different people include: 'unknown, unpredictable, ambiguous, weird, mysterious, unexplained, exotic, unusual, unfamiliar, curious, novel, odd, outlandish and strange.' A number of situations heighten the perception of threat among members of different cultural groups. Following is an exploration of how people make sense of information about others as they categorize or classify others in their social world (Koester & Lustig, 2006).

The first is ***ethnocentrisms.*** This is the notion that the beliefs, values, norms and practices of one's own culture are superior to those of others. All cultures teach their members the 'preferred' ways to respond to the world, which are often labeled as 'natural or appropriate'. This people generally perceive their own experiences, which are shaped by their own cultural forces as human and unusual. Muslims in Dadaab, who are also Somali in origin, have been taught that it is the only right way and hence easily label Christians as 'Pagans' who deserve to be killed. Christians also brand Muslims as terrorists. These counter prejudgments have for a long time caused a rift between two dominant religions in the region.

Cultures also train their members to use these categories for their own cultural experiences when judging the experience of people from other cultures. Our culture tells us that the way we were taught to behave is ‘correct and right’. William G. Sumner, who first introduced the concept of ‘ethnocentrisms, defined it as ‘ the view of things in which one’s own group is the centre of everything and all others are scaled and rated with reference to it. (Spencer and Fein, 1997)

Ethnocentrism is a learned belief in cultural superiority. Because cultures teach people what the world is ’really like’ and what is ‘good’, people consequently believe that the values of their culture are natural and correct. Thus, people from other cultures who do things differently are wrong. When combined with the natural human tendency to refer what is typically experienced ethnocentrism produces emotional reactions to cultural differences that reduce people’s willingness to understand disparaged cultural messages.

Ethnocentrism tends to highlight and exaggerate cultural beliefs. The following are glaring differences among people living in Dadaab Refugee Camp:

1. While there is mixing of members of different sexes freely among non-Muslims, Muslims scorn that as immoral and do not even share a venue at the place of worship.
2. While non-Muslim women dress as they wish, Muslim women adhere to a strict religious dress code. The muslin practice on dressing is seen to influence how some non-Muslims dress. Some have also started to cover themselves completely in order to fit in the environment in which they serve.
3. While non-Muslims take alcohol, Muslims do not. This has caused a lot of misunderstanding between the two groups.

To be a competent intercultural communicator, you must realize that you typically use the categories of your own culture to judge and interpret the bahaviours of those who are culturally different from you. You must also be aware of your own emotional reaction to the sights, sounds, smells and variations in message systems that you encounter when communicating with people from other cultures. The competent intercultural communicator does not necessarily suppress negative feelings but acknowledges their existence and seeks to minimize their effect on her or his communication.

The second aspect is ***stereotyping***. Journalist Walter Lipmann introduced the term ‘stereotyping’ in 1922 to refer to a selection process that is used to organize and simplify perceptions of others. (Stereotypes are a form of generalizations about some group of people. When people stereotype others, they take a category of people and take a category of people and make assertions about the characteristics of all people who belong to that category. The consequences of stereotyping id=s that the vast degree of differences that exit in the interpretation of messages.

Stereotypes start by outgroup category -‘they’- whose characteristics differ from those in one’s own social group. Next, the perceived dissimilarities between the groups are enlarged and accentuated thereby creating differences that are clearer and more distinct. By making sharper and more pronounced boundaries between the groups, it becomes more difficult for the individuals to move from one group to another. Concurrently, an evaluative component is introduced whereby the characteristics of the outgroup are negatively judged; that is, the outgroup is regarded as wrong, inferior, or stigmatized as a result of given characteristics are attributed to all people who belong to the group so that a specific person is not a unique individual but as a typical member of a category.

Categories that are used to form stereotypes about groups of people can vary widely (regions, countries, cities, cultures, races, religions, age, occupation, physical characteristics, gender, and social class). Stereotypes can be very inaccurate (Judd & Park, 1993). This inaccuracy can lead to errors in interpretations and expectations about the behaviour of others.

Interpretation errors occur because stereotypes are used not only to categorize specific individuals and events but also to judge them. That is, one potentially harmful consequence of stereotypes is that they provide inaccurate labels for a group of people, which are then used to interpret subsequent ambiguous events and experiences involving members of these groups.

Because stereotypes are sometimes applied indiscriminately to members of a particular culture or social group, they can also lead to errors in one's expectation about the future behaviour of others. Stereotypes provide the bases for estimating, often inaccurately what members of the stereotypes group are likely to do. Most disturbingly, stereotypes will likely persist even when members of the stereotyped group repeatedly behave in ways that disconfirm them (Seta & Seta, 1993).

The process underlying stereotyping is absolutely essential for human beings to function. Some categorization is necessary and normal. Indeed, there is survival value in the ability to make accurate generalizations about others, and strereotypes function as mental 'energy-saving-devices' to help make those generalizations efficiently (Mcrae, 2011). However, stereotypes may also promote prejudice and discrimination toward members of cultures other than one's own. Intercultural competence requires an ability to move beyond stereotypes and to respond to the individual. Previous experiences should be used only as guidelines or suggested interpretations rather than as hard and fast categories. Judee Burgon, Charles Berger and Vincent Waldron suggest that mindfulness –that is paying conscious attention to the natural and basis of one's stereotype s can help reduce stereotype inaccuracies and thereby decreasing intercultural misunderstandings (Burgon, Burger & Waldron, 2000).

Another barrier to successful intercultural communication is ***prejudice***. Prejudice refers to negative attitudes toward other people that are based on faulty and inflexible stereotypes. Prejudiced attitudes include irrational feelings of dislike and even hatred for certain groups, biased perceptions and beliefs about the group member that are not based on direct experiences and firsthand knowledge, and a readiness to behave in negative and unjust ways towards members of the group. Prejudiced people ignore evidence that is inconsistent with their biased viewpoint or they distort the evidence to fit their prejudices.

Prejudices serve certain functions. Lustig and Koester (2006) discuss the following as functions of prejudices:

1. Prejudice satisfies utilitarian function. Displaying certain kinds of prejudices means that people receive rewards and avoid punishments. For example, if you express prejudicial statements about certain people, other people may like you more. It is also easier to simply dislike and be prejudicial toward members of other groups because they can then be dismissed without going through the effort necessary to adjust them.
2. Ego- defensive function: This protects self- esteem as is observed by Lapinski and Boste, 2001). If others say or do things that are inconsistent with the images we hold of ourselves, our sense of self may be deeply threatened, and we may try to maintain our self-esteem by scorning the sources of the message.
3. Value expressive function: If people believe that their group has certain qualities that are unique, valuable, good or in some way special, their prejudicial attitudes towards others is a way of expressing those values.
4. Knowledge function: There are prejudicial attitudes that people hold because of their need to have the world organized and boxed into categories. The rigid application of categories and the prejudicial attitudes assigned to certain behaviour and beliefs provide security and increase predictability.

Discrimination is yet another problem of intercultural communication. Whereas prejudice refers to people's attitudes or mental representations, the term discrimination refers to the behavioural manifestation of that prejudices. This discrimination can be thought of as prejudice ‘in action.’

Discrimination can occur in many forms. From the extremes of segregation and apartheid to biasness in the availability of housing, employment, education, economic resources, personal safety and legal protection; discrimination represents unequal treatment of certain individuals solely because of their membership in a particular group.

Tevin Van Dijk notes that ‘when individuals make prejudicial comments, tell jokes that belittle and dehumanize others, and share negative stereotypes about othes, they are establishing and legitimizing the existence of their prejudices and laying the ‘communication groundwork’ that will make it acceptable for people to perform discriminatory acts.’ (Van Dijk, 1987)

Often, biases and displays of discrimination are motivated not by direct hostility toward some other group but merely by a strong preference for, and loyalty to one’s own culture.

Uncertainty Reduction Theory: Improving Intercultural Relationships

Communication theorist William Gudykunst (1995,1998,2005) stresses that the primary characteristics of relationships in intercultural adaptation is ambiguity. Reducing anxiety and seeking information, a process known as Uncertainty Reduction, can reach the goal of effective intercultural communication. There are several kinds of uncertainty. Predictive uncertainty is the inability to predict what someone will say or do. We all know how important it is to be relatively sure how people will respond to us. Explanatory uncertainty is the inability to explain why people behave as they do. In any interpretation, it is not important only to predict how someone will behave but also to explain why the person behaves in a particular way (Nakayama and Martin, 2010).

Competent interpersonal relationships among people from different cultures do not happen by accident. They occur as a result of the knowledge and perceptions people have about one another, their motivations to engage in meaningful interactions and their ability to communicate in ways that are regarded as appropriate and effective. To improve these interpersonal relationships, then, it is necessary to learn about cultures and thereby reduce anxiety and uncertainty about people from other cultures, to share oneself with those people, and to handle the inevitable differences in perceptions and expectations that will occur.

This paper uses Uncertainty Reduction Theory to qualify that when uncertainties about the other group are reduced, people get along and conflicts, prejudices and doubts are consequently reduced.

Berger and Calabrese (1975) maintain that ‘communication behaviour is one vehicle through which such predictions and explanations are themselves formulated. Individuals have the ability to decrease uncertainty by establishing predictable patterns of interaction. Because of this, reducing uncertainty can help foster the development of relationship. This model assumes that to communicate effectively we will gather information to help us reduce uncertainty and anxiety. The theory predicts that the most effective communicators (those who are best able to manage anxiety and explain others’ behaviours):

1. Have a solid self-concept and self-esteem
2. Have flexible attitudes (a tolerance for ambiguity, empathy) and behaviours
3. Are complex and flexible in their categorization of others (e.g. able to identify similarities and differences and avoid stereotypes).

The situation in which communication occurs is important in this model. The most conducive environments are informal, with support from equal representation of different groups. This model also requires that people be open to new information and recognize alternative ways to interpret information.

Berger and Calabrese (1975) found that uncertainty was related to seven other communication and relational concepts: verbal output, nonverbal warmth, information seeking, self-disclosure, reciprocity, similarity and liking. From those concepts, the researchers introduced a collection of axioms or propositions supported by past uncertainty research. Each axiom states a relationship between a communication concept and uncertainty. From this basis of axioms, the theorists were able to use deductive logic to infer twenty-one theorems that comprise the theory of Uncertainty Reduction (West & Turner, 2000).

Axioms and Theorems of Uncertainty Reduction Theory

1. Given the high level of uncertainty present at the onset of the entry phase, as the amount of verbal communication between stranger's increases, the level of uncertainty for each interaction in the relationships will decrease. As uncertainty if further reduced, the amount of verbal interaction will increase.
2. As nonverbal affiliate expressiveness increases, uncertainty levels will decrease in an initial interaction situation. In addition, decreases in uncertainty level will cause increases in nonverbal affiliative expressiveness.
3. High levels of uncertainty cause increases in information seeking behaviour. As uncertainty levels decline, information seeking behaviour decreases.
4. High levels of uncertainty in a relationship cause decreases in the intimacy level of communication content. Low levels of uncertainty produce high levels of intimacy.
5. High levels of uncertainty produce high rates of reciprocity. Low levels of uncertainty produce low reciprocity rates.
6. Similarities between persons reduce uncertainty while dissimilarities produce increases in uncertainty.
7. Increase in uncertainty levels produce decreases in liking, decreases in uncertainty level produce increases in liking.

Central to Uncertainty Reduction Theory is the supposition that in initial interactions, individuals' primary concern is to decrease uncertainty and increase predictability regarding the behaviour of the self and the communicative partner. Individuals must be able to engage in proactive and retroactive strategies to learn how to predict what will happen and also explain what has already happened. Heath and Bryant (2000) state that uncertainty reduction theory is a powerful explanation for communication because it operates in all contexts to help explain why people communicate as they do.

Both individuals and cultures can differ in their need to reduce uncertainty and in the extent to which they can tolerate ambiguity and therefore in the means, they select to adapt to the world. The humans need to learn about others, to make sense of their actions and to understand their beliefs, values and behaviours has been generally studied under the general label of uncertainty reduction theory (Guererio & Afifi, 2000). This theory explains the likelihood that people will seek additional information about one another.

William B. Gudykunst (1996) has recently revised uncertainty reduction theory and renamed it anxiety/ uncertainty management theory. It now focuses more clearly on intercultural communication, incorporates the emotional or motivational component of intercultural competence, and emphasizes ways to cope with or manage the inherent tensions and anxieties that inevitably occur in many intercultural encounters.

To behave both appropriately and effectively in an intercultural encounter, one must make an accurate assessment about many kinds of information. The individual characteristics of the person with whom you contact; the social episodes that are typical of the particular setting and occasion, the specific roles that are being played within the episode, the rules of interaction that govern what people can say and do to the setting of context within which the interaction occurs, and the cultural patterns that influence what is regarded as appropriate and effective.

Conclusion

In Dadaab, there are many communities living there; as such, there are also varies cultures. For effective intercultural communication and resultant peaceful coexistence, there must be conscious efforts from all people living there to reduce uncertainty and hence increase interaction. This will help to do away with the negative stereotypes, prejudices and discrimination that are presently exhibited. Education is a key factor in reducing uncertainties as people from different cultures reduce uncertainties about other people. Therefore Intercultural Communication should be factored into the Kenyan curriculum to reduce several prejudices and enhance peaceful coexistence among all communities living in Dadaab and Kenya as a whole.

Reference:

Berger, C.R. and Calabrese, R.J. (1975). Some explorations in initial interaction and beyond: Towards a developmental theory of interpersonal communication. Human communication Research, 1, 99-112.

Gudykunst, B.W. (2005). Theorizing about Intercultural Communication. CA: Sage.

Gudykunst, B.W. (2003). Intercultural Communication Competence: Cross-cultural and Intercultural Communication. CA: Sage.

Lustig,M. and Koester, J (2006). Intercultural Competence: Intercultural Competence Across cultures. USA: Pearson.

Lustig, M and Koester, J (eds). (2008). Among US: Essays on Identity, Belonging and Intercultural Competence. USA: Allyn and Bacon.

Nakayama, T.K., and Martin N.J. (2010). Intercultural communication in contexts. NY: McGraw Hill Company.

Spitzberg, H.B., nd Berge, K. (2001). Human Communication: Motivation, Knowledge and Skills. CA: Wordsworth.

Ting-Toomay, S. and Gao, G. (1998). Communicating Effectively with the Chinese. CA: Sage.

Oskamp S (ed). (2000). Reducing Prejudice and Discrimination. NJ: Earlbaum.

DEFINING AND MEASURING TECHNICAL THINKING: STUDENTS' TECHNICAL ABILITIES IN KENYAN INSTITUTES OF SCIENCE AND TECHNOLOGY

J. A. Omoro
Pwani University

M. O. Udoto
Egerton University
J. K. Kibett
Egerton University

W. O. Ochola
AfricaLead II

Technical, Industrial, Vocational and Entrepreneurship Training (TIVET) programme in Kenya is vital for skills development among Primary and Secondary School leavers. Over 300,000 Primary School and more than 200,000 Secondary School leavers join TIVET institutions or the informal sector. TIVET programmes face challenges of inflexible and outdated curriculum, mismatch between skills learned and those demanded by industries: inadequate mechanisms for quality assurance and inadequate physical facilities for training among others. The purpose of this study was to define and measure students' technical thinking abilities in Kenyan Institutes of Science and Technology. The study used a pretest-posttest control group experimental design to collect data. Three components of technical thinking including a balance of knowledge, competence (skill) and emotional engagement were key variables in data collection. 11 Institutes of Science and Technology in Kenya's eight Provinces provided 267 students who participated in the study. Technical achievement was assessed using three tests that corresponded to the conceptualization of technical thinking, capturing psychomotor, cognitive and affective domains. Descriptive statistics were used to analyze data collected. Results revealed that in the psychomotor area (motor competence), students technical abilities improve quite a lot even with a small amount of practice whereas in the technological and affective knowledge domains, achievement was similar between experimental and control groups. The study recommended that a balanced curriculum that draws deliberately upon examples from everyday life situations as well as from textbooks from the educational sciences should be availed for TIVET programmes.

Key words: Defining, Measuring, Technical Thinking, Skills, Education, Technology, TIVET

Introduction

The terms "technical" and "technology" are widely used by educators, workplace practitioners, and the general public. Seldom, however, is there a written explanation of a technologist or technician's attributes (Hansen, 2004; Rophol, 2003). What do technicians know and do? Also absent from public consciousness is a sense of what constitutes the design or problem-solving process which precedes any technological act. By comparison, media depictions of technology as computers, electronics, and tools are widespread and the public appetite for these depictions is extensive (Dyrenfruth, 2005). In teacher education and in schooling itself the subject through which technical skills and knowledge are imparted suffers from confusion about definition as well. What is technical thinking? What is technical aptitude? Why is it that technology teachers can recognize this ability when it is observed in students but they, and educators generally, have difficulty documenting the essence of it in writing?

Van der Velde (1992) asserts that to expose what it means to be a technologist, the investigators in this research project examine what students in Kenya' institutes of Science and Technology learn in their study and practice of technology. Why, you might ask, would the authors attempt to better understand what it means to have a technical orientation or technical ability by studying technology students, in this case Kenyan students? The answer has two parts. First, from a research perspective, students 'responses to adult inquiries are often more informative and authentic than those of adults. Secondly, teachers of technology have had to think about their field, especially how to teach it. In doing so, they have to know about the substance of their subject. By comparison, practicing technicians and technologists may not have been required to think through what they know and do, much less express it.

Kamau (2001) found that the case of Kenya's students and institutes of science and technology is especially timely since Kenya has over forty million people with a reputation for cherishing inventiveness and aesthetics. The essence of the creative and rational process of technology and design in Kenya (Pamella, 2004) is found in the connection between nature and people since the instincts as human beings to observe, appreciate, and respect/disrespect the patterns/cycles of the natural environment is a particularly important issue in Kenya.

The eye of the trained and untrained observer absorbs many facets of the physical and manufactured worlds (Amadi, 1999). The combination of these activities (to see, touch, think, and do) is called "technology." It is itself, the inherent capacity of the technologist. The degree to which students experiment with regard to the physical world is the degree to which each is a prospective technologist. In Kenya the connection between technology and culture is a deliberate part of the technology curriculum (KIE, 2006).

Technology as a technical subject in Kenyan technical institutions has a long and rich history dating back to the 1960s when technical education was given a lot of attention (Komen, 2006). It has evolved and is still evolving in such a way that examination of its essential elements is particularly informative. In particular, the attention to technical thinking which emerges from this history and which the focus of attention in this study is, informs readers about a host of important issues. Policy regarding the importance and place of technological education in TIVET institutions, how best to recruit and prepare technology tutors, and what to teach students in the institutes curriculum, head the list of issues that are associated with understanding "technical thinking"(KIE, 2006).

Pamella (2004) indicated that Kenya's' tradition in craft education is unique and for years students have engaged themselves in creative and reproductive handwork using a variety of craft and machine tools. She further found that in the early years of the last century workshop learning focused on reproduction handwork as a pedagogical strategy for developing student insight into the technological world. More recently, the curriculum has included creative handwork, textbook learning, and innovative technology (see Figure 1).

The curriculum was and is geared mainly toward the development of starting-level technical thinking skills. For males this involved crafts handiwork; for females, textiles handiwork. In 2007 the new Kenyan curriculum (KIE, 2006) specified that technical craft and textile craft should be combined into one subject, taught to both male and female students over their entire comprehensive institute lives. Craft learning was designed as a comprehensive curriculum to develop psychomotor skills, "technical thinking" (knowledge), and work ethics.

"The student learns to appreciate work, to master the lifespan of the product, and to adopt the principle of sustainable development by using different planning and problem-solving methods (William & Williams, 2006). During the production process both a student and a tutor are continuously considering environmental, cultural, and nature values" (KIE, 2006). The value of craft teaching is described in the TIVET curriculum as the appreciation of work in respect to ethics, ecology, aesthetics and economy, safe working habits, responsibility, consideration for others, and the all-round development of the student.

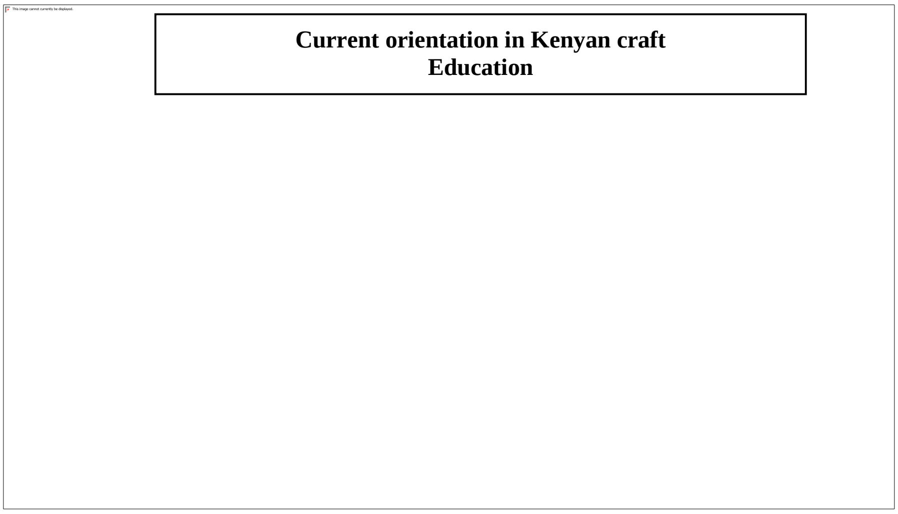


Figure 1: Current Orientation in Craft Education in Kenya

The TIVET curriculum (KIE, 2006) requires that students learn to apply theoretical information to practical work that they do through planning, making, and choosing the craft products. The aim of the subject is to live through the work process where, between the start of an idea and reaching the final result, there is growth in creativity, thinking, and the development of self-esteem"(Barongo, 2006).

The aim is to have students acquire the essential skills needed to manage their everyday lives. Learning, in its pedagogical sense, is experiential. The study of craft is, above all, practical rather than academic. Dyrenfruth (2005) found that outcomes from learning include individual responsibility, initiative, creativity, perseverance, and a positive picture of oneself. Self-esteem, the report suggests, is built on practical rather than academic achievement.

The KIE (2006) curriculum proposes new approaches to students' all-round development and reveals that technology education as a term is seldom mentioned in government document development plans; however, it's shadow, as cast by a growing number of middle school level technology education curricula in other countries, is evident (Rophol,2003). The fact that technology in Kenya continues to be taught using formal workshop methods, with less emphasis on computer simulations, may be significant (Kamau, 2001).

Kenya is often mentioned as a country where innovative technology, e.g., cell phone products, is prominent, yet that reputation appears to be attributable, in part, to a traditional curriculum unlike that being espoused in many contemporary school systems around the world (Amendi, 2003). Kenya is quickly becoming one of the countries in the world that has a compulsory stand-alone technological arts subject in its primary schools, and a system of teacher preparation for that subject but its schools do not have a subject equivalent to technology education in the United States. Technology education, to the extent that it has evolved in Kenya, has been taught as a part of the instruction in science and craft education (see Figure 2). Only in 2006 was technological literacy introduced as a national educational objective. This study addresses the Kenyan "case" by investigating how students become technical thinkers, through traditional and contemporary craft curricula with a technological literacy emphasis.

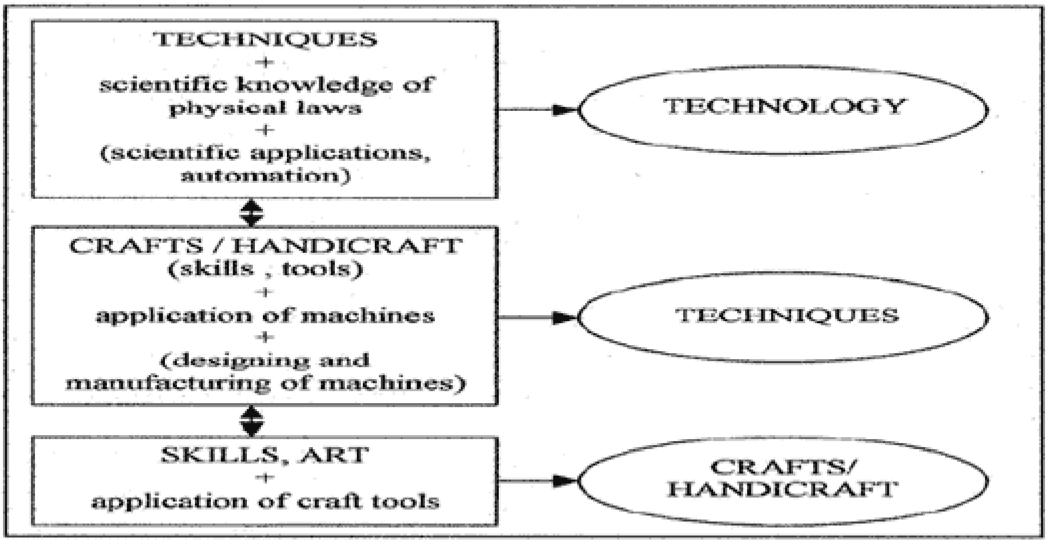


Figure 2: Conceptual Foundation of Technology

Evidence (Amadi, 1999) suggests that instructional goals and methods in Kenyan Institutes of Science and Technology are changing. Komen (2006) found that reproduction handwork and design are being merged with general knowledge of craft tools and technological literacy. Historically, technological education in Kenya fulfilled the requirements of an agricultural society (Amadi, 1999), whose emphasis was on tool and machine use but today, like many developed countries, it seeks to meet the requirements of a post-industrial society, complete with scientific knowledge of physical laws and automation. Pamella's conception (Figure 2) of the relation between technology, techniques, and crafts is helpful in describing one vision for something other than technological arts in Kenya's Institutes of Science and Technology.

In spite of Pamella's proposed reconceptualization, Amadi (1999) points out that woodwork is still the most popular technological activity in Kenyan Institutes of Science and Technology as it is clearly more popular than other activities such as plastic work, metal work, service and repair of technical equipment and construction of electronic equipment. Least popular are construction kits, internal combustion engines, and familiarity with technological equipment. He opines further that computers are not commonly used in these programs, although usage is expected to increase in the near future. Kenya reveres a practical pedagogical tradition in the teaching of technology and this is related to the country's apparent success in both the design arts and in the new technology fields (Kamau, 2001).

The changes that have occurred in Kenyan classrooms and workshops are encouraging since much work is being done to introduce the principles of creative problem solving (De Luca, 2004). However, the search for clarity, confirmation, and definition of technology education is on going. According to Hansen (2004), a formal definition of "technology education," for example, has not been articulated but more important, an understanding of the elusive aptitude known as "technical thinking" and its roots remain a source of debate. The fundamental issues are as follows: Can "technical thinking" be defined and measured? What is the relation between an experiential pedagogy and developing the ability to think technically?

Purpose of the Study

The purpose of the study was to define and measure students' technical thinking abilities in Kenya's Institutes of Science and Technology. The study sought to explore, in a preliminary way, whether or not a curriculum which combines or retains traditional textile and technical crafts, or new technology education, would enhance technical thinking among students in technical institutes.

Research Questions

The following research questions guided the study:

1. Could/can student achievement in technological knowledge, competence, and emotional engagement be identified and measured?
2. Could/can technical thinking ability in students be attributed to different treatments, i.e., traditional curriculum versus technology enhanced combined crafts curriculum?
3. Are there any differences in development between male and female as a result of these different treatments?
4. Is individual student technical ability evenly distributed across motor skills, technological knowledge, and emotional engagement?
5. What impact, if any, can be attributed to the pedagogy practiced in traditional craft education compared to the emerging pedagogy practiced in more contemporary classrooms/workshops?

Methodology and Data Collection Procedures

This study used a Pretest-Posttest Control–Group Design, which also utilized an intermediate measurement. Design was appropriate as it includes a control group and has random assignment, hence controls for most standard threats to internal validity. Figure 5 shows the design.

Defining and measuring technical thinking as a construct was achieved by extending the work of Dyrenfurth (2005) and Layton (1994). They identified three components that correspond with what the authors considered to be the dimensions of technical thinking. The first is technological knowledge. Citizens in a democratic society, according to Dyrenfurth, know something about technological concepts, principles, and connections, as well as the nature and history of technology.

This kind of "knowing" is often referred to in the educational sciences literature as the cognitive domain. The second dimension of technical thinking is skill or "competence." Technical and technological skills are part of most human activity and are essential for the survival of humankind. These skills are often labeled by psychologists as "psychomotor" skills and are an important component of technical thinking. These skills involve tactile or kinesthetic ability and practical intelligence. The third dimension is technological will or "being active and enterprising." Technology is determined and guided by human emotions, motivations, values, and personal qualities (Sherif & Sherif, 2003). Thus the development of technology in society is dependent on citizens´ technological will to participate in, and have an impact on, technological decisions (individual and/or societal). This is the affective or emotional aspect of technical thinking. Technical thinking, in short, involves a balance of knowledge, competence, and emotional engagement. In its fullest sense it is the act of using human ingenuity or, being ingenious.

After extensive pilot work, three test instruments were developed, one to measure each of (a) competence/motor skills, (b) technological knowledge, and (c) emotional engagement. The test of motor skills is called X-boxes and was based on the theory of Powell, Katzko & Royce (2002) and Fleishman & Hempel (2001) (see Figure 3). In this test all the elements of bodily orchestration, precision, vocalization, motor reactivity and dynamism are involved. The reliability of this test was 0.819 as measured with the Cronbach Alpha.

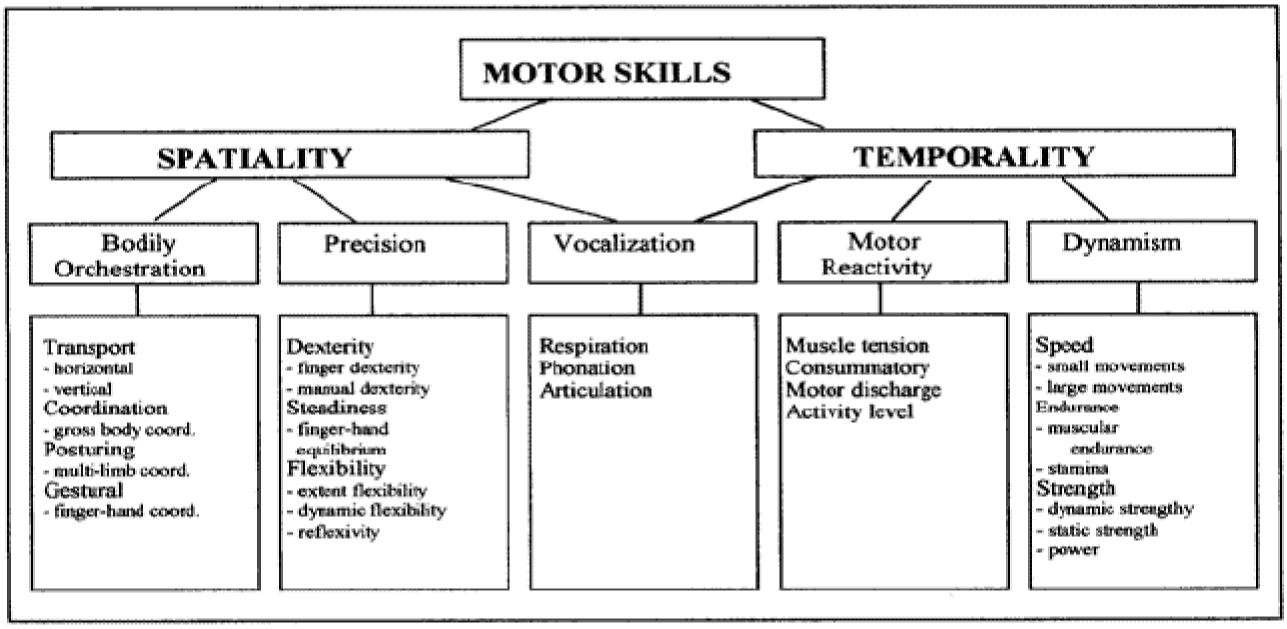


Figure 3: The Hierarchical Structure of Motor Skills
Source: Powell, Katzko & Royce, 2002, p.194

To detect and measure the cognitive dimension of technical thinking, the instrument used was a test of "technical knowledge." It consisted of three different parts with twenty-eight questions. The questions deal mainly with physical laws, often observed in simple machines. Other aspects of technical knowledge are also involved, e.g., tool design and application. The reliability of the test, measured with the Cronbach Alpha, was 0.881. Figure 4 provides some example questions.

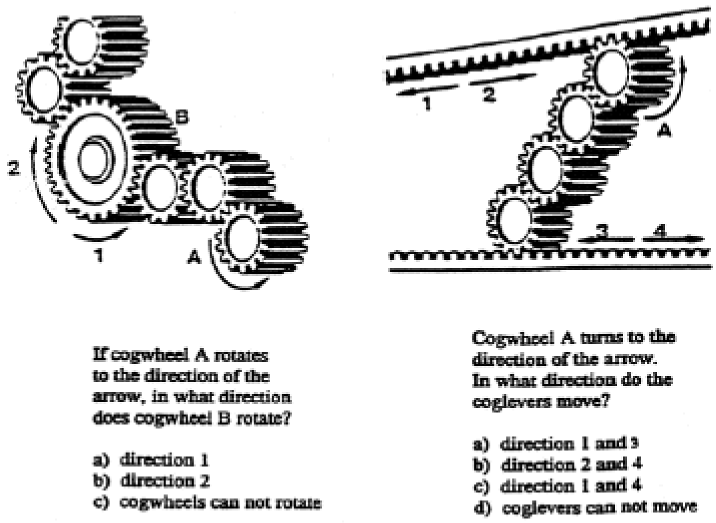


Figure 4: Example of Technical Thinking Questions

Emotional engagement was measured with a questionnaire based on the SATT (Students Attitudes towards Technology) material designed and tested by Raat & de Vries (2004) and van der Velde (1992). The designers tested the questionnaire on several occasions. From their studies six factors associated with technical attitudes were found: interest in technology, favourite role models, understanding that consequences are a reality, some aspects of project work are difficult, attitudes towards school and technology, and career aspirations. These factors were used to establish the final test B, a questionnaire with fourteen Likert scale statements. Although attitudes are not best measured with paper and pencil tests, the test worked quite well, especially in detecting differences between the control and experimental groups. Test reliability was 0.853.

Evidence that the new curriculum in Kenya either fostered or discouraged technical thinking in students would require that these three instruments be applied in the classroom. Each instrument was used three times over four years (pre-measurement, intermediate, and final measurement). Data were collected on 267 students in grades five to nine. The experimental group consisted of four classes from the Rift Valley Institute of Science and Technology (RVIST) in Nakuru County. Male and female students were given a new curriculum that combined technical and textile craft projects at the grades five to seven level (two classes), and an additional technology component at the grades seven to nine level (two classes). This curriculum included the teaching of problem solving with computer animations, as well as "hands-on" projects. The control group included classes from four local institutes in the same county.

Each class used the traditional crafts curriculum and pedagogical methods. Males worked on technical craft projects, females on textile craft. These four classes worked on projects that included wood and metal work, with some electronics. The grades seven to nine males received a slightly greater emphasis on computers and electronics. The textile craft curriculum included mostly handwork and machine sewing. The classes were organized according to grade level and craft subject. In textile craft ninety-nine percent of the students were females and in technical craft/technology ninety-five percent were male.

Technical achievement was assessed using three tests that correspond to the conceptualization of technological thinking described earlier: 1) psychomotor domain (human competence/motor skills), 2) cognitive domain (technological knowledge), and 3) affective domain (emotional engagement). The research design is described in Figure 5.

Groups	**Pre-Measure-ment**	**Treatment**	**Interme-diate Measure-ment**	**Treatment**	**Final Measure-ment**
Experimental group Combined craft (*n*=116)	O_1	X	O_2	X	O_3
Control group (*n*=151) Technical & textile craft	O_1	X	O_2	X	O_3
Test Instruments/Areas	-motor skills -technical knowledge -attitudes/ emotions	-combined technical/ textile	-motor skills -technical knowledge -attitudes/ emotions	-com-bined -technical/ textile	-motor skills -technical knowledge -attitudes/ emotions

Figure 5: Research Design

Data Analysis

Data were summarized using descriptive statistics. Means and frequencies were used to compare competence/motor skills and technological knowledge data. Emotional engagement which captured students' attitudes towards technology used means and standard deviations for comparisons. ANOVA was used compare means on scores and ANCOVA used to statistically equate groups on the pretest or some other variable, also to adjust dependent variable scores for the differences that exist on control variable.

Results

The results show that in the psychomotor area (motor competence), student technical abilities improve quite a lot even with a small amount of practice. Significant improvement (p < 0.001) was found in both control (textile and technical craft) and experimental groups (combined craft). Students excel at psychomotor activities in craft related projects. Figure 6 shows how psychomotor development increases from one grade level to the next.

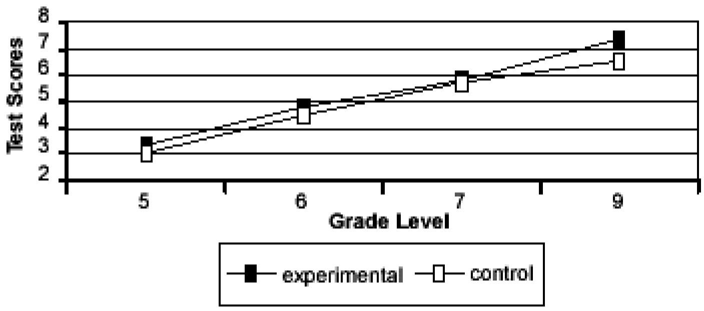


Figure 6: Development of Psychomotor Skills (*n* = 267, *p* < 0.001)

According to the data there were no significant differences between the motor competencies of males and females, although, in the final measurement (grade nine), a significant difference was found ($p = 0.01$, see Table 1). Differences from one grade level to the other were also significant ($p < 0.001$), i.e., between students in grade five versus those in grades seven, and between grades seven and nine. Interestingly the experimental group achieved better results in every measurement. When technical and textile craft are combined, competence and motor skills receive more emphasis than technological knowledge. The wider range of experiences with different materials and projects may be an important factor.

Table1: Average Scores in Motor Skills

Group	Pre-Measurement	Intermediate Measurement	Final Measurement
Experiment group (*n*=116)	4.17	5.58	6.68
Control group (*n*=151)	3.80	5.00	6.29
Males (*n*=161)	4.05	5.26	6.58
Females (*n*=106)	3.83	5.23	6.28

In the cognitive (technological knowledge) domain, achievement is similar between the control and experimental groups (see Figure 7). Even when students reach the grade seven to nine level their technological knowledge increases at a steady rate.

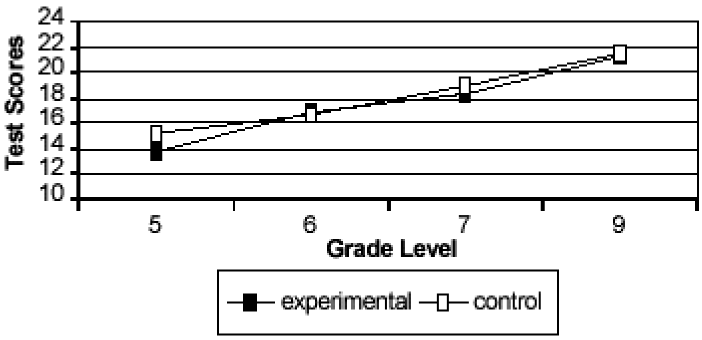


Figure 7: Development of Technological Knowledge (*n* = 267 *p* < 0.001)

According to the data (Table 2) there are significant statistical differences in the cognitive domain between boys and girls ($p < 0.001$). This finding corroborates results in other studies that look at cognitive development (Amendi, 2003; Hannah, 2005; Kamau, 2001). By contrast, there were no statistical differences between the control and experimental groups on test scores. This is due to the fact that in the cognitive area, the older girls had much better results in the combined craft than in textile craft. It seems that the females in combined craft benefit from technical craft lessons even though some project work was not technological. Among younger boys the result was the opposite. Males in the control group (technical craft) scored better than boys in the combined craft (experimental group).

Table 2: Average Scores in Technological Knowledge

Experiment/Control Group	Pre-Measurement	Intermediate Measurement	Final Measurement
Experiment group (*n*=116)	16.16	17.33	20.24
Control group (*n*=151)	16.15	17.53	20.61
Males (*n*=161)	17.38	18.87	21.72
Females (*n*=106)	14.29	15.27	18.52

In the affective domain (emotional engagement) change over time was not distinguishable. Only in the higher grades, when students are able to concentrate more seriously on activities in which they were genuinely interested, do attitudes towards technology change (see Figure 8 and Table 3). It may be that another variable intervenes in this area of human development. For example, students could be developing attitudes about technology outside of school as Sherif & Sherif (2003) found in their research

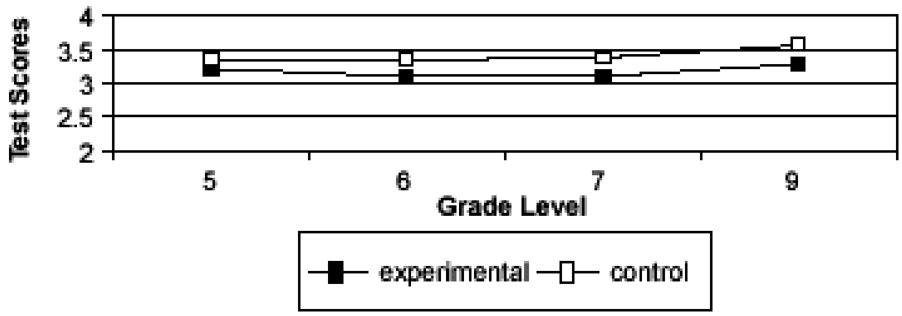


Figure 8: Development in attitudes toward technology (n = 267)

The data show there are significant statistical differences in the affective domain between males and females ($p < 0.001$) (see Table 3). The pattern is the same as in the cognitive area. Little change occurs until the middle school years, at which point interest in, commitment to, and respect for technology, increases. The difference between the control and experimental group may be due to the fact that the commitment among males is higher when they can fully concentrate on the craft area which interests them most and for which they have the greatest capacity. Also, in combined craft, every class (except for the older males) had similar pre-and-final measurement scores. Attitudes towards technology (emotional engagement) scores remained constant for males except for a modest increase after grade seven. Females' scores, when the new curriculum was introduced, actually went down (2.88 to 2.72), but improved in grade nine when they could concentrate in their own area.

Table 3: Average Scores in Attitudes towards Technology

Group	Pre Measurement	Intermediate Measurement	Final Measurement
Experiment group (*n*=116)	3.20	3.09	3.15
Control group (*n*=151)	3.31	3.35	3.51
Males (*n*=161)	3.51	3.57	3.70
Females (*n*=106)	2.88	2.72	2.84

Discussion

The 2006 Kenyan curriculum of crafts specifies that technical and textile craft should be combined into one subject, which should be taught to both male and female students over their entire comprehensive school lives. This study suggests that such a recommendation is supportable but that some topics should be taught in homogeneous groups. If females do require more time for development, they should have some opportunity to learn independently from the males, perhaps as a pedagogical strategy, e.g., in the design and completion of projects. They should have more opportunities to concentrate on materials and projects with which they are familiar and comfortable.

Craft is described as a comprehensive subject that offers all-round education, develops the skills of the hand and thinking, and teaches students to work. Several years after the new curriculum, the tradition of teaching technical craft to males and textile to females is as entrenched as ever. Renewal in the curriculum has not changed much but could if curriculum planners understood how a pedagogical strategy and curriculum content are distinctive but complementary. In other words, organize the curriculum and instruction so that students have a personally meaningful experience.

The vision of technology education as a subject of its own at the national level, evolving either partially or entirely from crafts, is a realistic one. Pamella's (2004) three alternatives for implementing technology education in Kenyan institutes of science and technology could be a possible curriculum conceptualization. It would be useful though, to classify knowledge in a practical rather than scientific way. For the senior secondary schools this conceptualization would have to be more experiential and accommodate local community culture and heritage.

The tendency for comprehensive secondary schools to be university preparation sites that perpetuate an academic milieu is already widespread. While the study did not directly solicit anecdotal information in this regard some observations and recordings were noted. Some of the males, for example, made their feelings clear about their learning in crafts compared to other school subjects. They found the learning activities in non-craft subjects to be mindless and meaningless.

Interestingly, these males were the ones who often had the best results in the test of motor skills. Perhaps the preference by some students for experiential pedagogy practiced in craft classrooms warrants investigation relative to the didactic pedagogy characteristic of other subjects. Further study is required.

Given the results of this study, every student in Kenyan institutes of science and technology should be given a balanced curriculum that draws deliberately upon examples from everyday life situations as well as from textbooks from the educational sciences. In addition, every student should also be given an opportunity to concentrate more seriously on the craft area that most interests him or her. In light of the different interests held by males and females for motor skill development, technological knowledge, and emotional engagement, designing technological studies curricula for different genders in a particular age group is crucial in the policy and planning process. As early as in nursery school, teachers may need to concentrate more on crafts that place equal emphasis on textiles and mechanics, drawing judiciously on projects that are relevant and of prime interest to students.

De Luca (2004) and Williams and Williams (2006) argue that creative problem-solving activities should be an integral part of craft-and-technology education in contrast to teacher-directed reproduction handwork. Others (Wu, Custer, & Dyrenfurth, 2004) suggest that problem solving itself should determine the content and teaching method employed. This is an issue that will require further study and thought in the opinions of the authors. An especially important aspect of education in, about, and through technology, and teacher education, is the opportunity of utilizing fresh ideas and approaches. For example, by adopting alternative pedagogical strategies at the university and comprehensive school levels, it is possible that more could be learned about the value of teaching problem-solving strategies and the relation of those strategies to psychomotor skills and emotional development.

This study shows that a better understanding of what students learn when they exercise their minds and bodies concurrently is important. Learning takes place upon completion of a product but also through reflection in every phase of the technological process. But does current research acknowledge and address this connection? Above all, do students understand that technology (the combining of body, spirit, and mind) is directed by human needs and wants, including their own? Technological and social development can be reconciled.

Every generation needs to understand how its technological culture and its human evolution process interact. The kinds of artistic and technological/ practical experience needed to enhance meaningful social progress and to design school curriculum exist. Needed now, in Kenya and beyond, is the willingness to further define and commit to an experiential pedagogy and heritage in TIVET programmes.

Conclusions

The results show that in the psychomotor area, technical thinking achievement improves steadily over the four years. It seems that students excel at psychomotor activities in all project areas, perhaps because they see meaning in their accomplishments, even with small amounts of practice. The research design did not control for normal maturation so it is not possible to state unequivocally that the new curriculum caused these achievement levels.

In the area of technological knowledge (cognitive domain), the results were not as supportive for the post-2006 model of craft education. Remarkable differences were found especially between males and females in the younger age group. This finding suggests that a heavier or different emphasis on technical thinking for girls may be required in the curriculum. They (females) should have equal opportunities to develop their technical thinking at primary school and earlier. One area of need for the Kenyan school curriculum is early emphasis on technological knowledge. By comparison, the results in the affective domain followed the same pattern as those in the cognitive. The impact of the post-1994 curriculum on attitudes is problematic. Differences were found between males and females in all age groups. Male attitudes toward technology, i.e., emotional maturity, occurred earlier and more quickly than that of females. This finding corroborates with results found in teacher training (Amendi, 2003).

The data from this study suggest that the definition of technical thinking as human ingenuity in problem solving is measurable. Furthermore, motor skill development (spatiality and temporality) is an aspect of technical thinking and human development that can be taught successfully in crafts and textiles programs within institutes of science and technology. In every psychomotor exercise there is a lot of thinking and with every thought and action there is emotion. The combination of all three involves a cleverness, competence, and emotional will. The data, above all, suggest that the relationship between cognitive ability, motor development, and emotional development is one that needs to be recognized and valued in pedagogical terms. What is the relationship between these three inseparable areas of student development, and what are the implications for our understanding of how students learn and develop?

The data also suggest that male and female students differ in their interests and development with respect to technology. The difference between males and females in the affective domain has an influence on females´ motivation for learning about technology and even on their future career decisions (Barongo, 2006; Hannah, 2005). In developing technology-related education programs, the cognitive differences between males and females need to be taken into account. The extent to which female students can improve their technical thinking in the future may hinge on how school programs are designed and implemented.

When curriculum specialists attempt to provide a good balance among attitudes, motor activities, and technological knowledge in teaching technology they should pay much more attention to the pace at which males develop versus females. The fact that it is difficult to sustain student commitment to practical problem solving questions through formal education is important to understand and respect. Young students may feel, because of the time and effort it takes to complete a project that they are not learning quickly enough at this stage of their development. Later, as their competencies and technical thinking improve, motivation and subsequent achievement increase.

References

Amadi, A. (1999). How to educate students for a technological future: Technology education in early childhood and primary education (Research Report No. 233, Publication Series B). Natal, South Africa: University of South Africa.

Amendi, O. (2003).Students´ development in technical abilities in Kenyan Institutes of Science and Technology. Research Report No. 177. Nairobi, Kenya: University of Nairobi.

Barongo, E. (2006). Gender in education: Educational policy in Kenyan Technical Training Institutes, 2002-2005. *Journal of Technology Education*, **23** (1), 11-22.

De Luca, V. W. (2004).Survey of technology problem-solving activities. *The Technology Teacher*, **51**(5), 26-30.

Dyrenfruth, M. J. (2005). Technological literacy: Characteristics and competencies, revealed and detailed. In: H. Szydlowski, & R. Stryjski (Eds.), *Technology and school: Report of the PATT conference* (pp. 26-50). Zielona Gora, Poland: Pedagogical University Press.

Fleishman, E., & Hempel, W. (2001).Changes in factor structure of a complex psychomotor test as a function of practice. *Psychometrika*, **19** (3), 239-251.

Hannah, D.F. (2005). Sex differences in cognitive abilities (2nd. ed.). Hillsdale, NJ: Erlbaum.

Hansen, R. (2004). Defining technology and technological education: A crisis or cause for celebration? *International Journal of Technology and Design Education*, **4**(2), 179-207.

Kamau, S. C. (2001). The effects of stimulus context on paper- and-pencil spatial task performance. *Journal of General Psychology*, **5**(16), 133-139.

Komen,N.P. (2006). Technological Change in Kenya: A case of Institutes of Science and Technology.A paper presented during the 4th International Conference at Moi University, Eldoret, Kenya

Layton, D. (1994). A school subject in the making? The search for fundamentals. In D. Layton (Ed.), *Innovations in science and technology education* (Vol. 5). Paris: Unesco.

KIE. (2006). *Framework curriculum for institutes of science and technology, 2006: A national report on technical curriculum*. Nairobi, Kenya.

Pamella,M.(2004). Technological competence: Challenges of reforming technology education in Institutes of Science and Technology. *Journal of Technology Education*, **23** (2), 47-53.

Powell, A., Katzko, M., & Royce, J. (2002). A multifactor system theory of the structure and dynamism. *Journal of Motor Behaviour*, **10**(3), 194-200.

Raat, J., & de Vries, M. (2004). *What do girls and boys think of techny?* (Research Report). Eindhoven, The Netherlands: University of Technology.

Rophol, G. (2003). Knowledge types in technology. In Marc J. de Vries and Arley Tamir (Eds.), *Shaping concepts in technology* (pp. 65-72). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Sherif, C. W., & Sherif, M. (2003). *Attitude, egoinvolvement and change*. New York: Wiley & Sons.

Van der Velde, J. (1992). Technology in basic education. In T. Kananoja, (Ed.), *Technology Education Conference* (pp. 151-170). Helsinki, Finland: The National Board of Education.

Williams, A., & Williams, J.(2006).Problem-based learning: An appropriate methodology for technology education. *Research in Science and Technological Education*, **15**(1), 91-103.

Wu, T. F., Custer, R. L., & Dyrenfurth, M. J. (2004). Technological and personal problem solving styles: Is there a difference? *Journal of Technology Education*, **7**(2), 55-69.

RECENT DEVELOPMENTS IN e-LEARNING PEDAGOGY: ROLE OF KENYATTA UNIVERSITY IN TEACHER EDUCATION

Samson R. Ondigi
Kenyatta University
ondigi@yahoo.com

Henry O. Ayot
Kenyatta University
hoayotk@yahoo.com

Fundamentally education is the organized process of inquiry of knowledge with the sole aim of being enlightened and empowered for self-inner development, success and happiness in life. Education is a pillar for both human capital growth and development of society. Today, e-learning has been identified as the tool for human capital development. Universities in Kenya should be prepared to spearhead the training of teachers on how to integrate technology during classroom teaching. The greatest challenge is the lack of comprehensive policy on eLearning pedagogy in teacher training institutions of higher learning. The specific objectives of this study were to (a) To identify university policy on e-learning as a tool for training, (b) Establish the implementation policy on e-learning as a training tool, (c) Establish the training challenges experienced in implementing the policy and (d) Development model on the implementation of e-learning as a tool for pedagogical training. The study used exploratory design to investigate the state of teacher training through e-learning and targeted 100 graduate student teachers and 10 lecturers in the Department of Educational Communication & Technology, Kenyatta University. The study used three sets of instruments including questionnaires, interview guideline and documentary analysis guide to collect data. Descriptive analysis was used to summarize the views of the respondents.

Key words: eLearning Pedagogy; Policy Formulation and Implantation; Skills Development

Introduction

It is believed that educational goals are set within the framework of a prevailing accepted world view or paradigm that education enables the learner acquire the knowledge and skills necessary for playing a useful role in the human society as well as to be resourceful in the solution of problems connected with his own needs. Essentially then, the primary objective of teaching is to promote the acquisition of necessary knowledge, skills and attitudes of students who graduate to serve society. To achieve this objective, teachers play an important role in the teaching-learning context, where they continuously use and create different teaching models, strategies, and tools (Sife, 2007; Van Der Sijde1989). Apparently, teachers have to be adequately prepared to carry out their mandate in the classroom. Teachers must possess adequate skills and knowledge to use the necessary resource, technologies and relevant strategies in imparting content to the learners in the classroom. In modern classroom operations, teachers use different tools to improve their teaching skills in varied disciplines by widely integrating available ICTs to improve their teaching styles (Scudder, n.d.; Liu 2011; Hew & Brush 2007; Donnelly, McGarr & O'Reilly 2011).

The effective use of ICTs in the classroom generally contributes to emergence of reforms in teaching and learning processes in all sectors of education (Pulkkinen, 2007; Nicoll & Harrison, 2003; Flexible Learning Advisory Group, 2013). The world of work today needs graduates with technological knowhow to propel the industrial growth and development of nations. Institutions of learning have a responsibility to produce learners well equipped with technology for work. Universities are tasked to research and train teachers on how to effectively use the tools and wheels of technology to revolutionize society. Teacher training institutions and more particularly universities should spearhead the need to embrace technology in the teaching and learning processes where developed nations are way ahead in using eLearning to ease the processes of teaching and learning. However, the use of ICTs and eLearning pedagogy in particular can only be used cautiously where practical and applicable (Boyer, 1990; Ramsden, 1992; ondigi, 2015). The use of eLearning in teacher training and particularly in the department of pedagogy can only be limited to the integration of ICTs in training as guided by the institutional policies on technological advancement of the said institution or accepted practices as dictated by relevant prevailing circumstances.

The Policy on eLearning

Evidently, policy aspects pertaining to eLearning should and where relevant be embedded in all university policies and procedures to ensure a consistent and corporate approach to associated systems, processes and responsibilities of all internal organs of the system in place. A well stipulated policy embedded in sound principles of pedagogical training of teachers will guide the processes of skills development among the trainees without compromising the professional standards expected of the teachers when in the field (Ondigi, 2015; Australian flexible Learning Framework. 2011). Thus, Kenyatta University in its quest to modernize teacher education and in particular the training of teacher has given guidelines which though meant to assist schools as whereas departments in the training processes, these guidelines do not spell out clearly the anticipated aims and goals of eLearning as highlighted in an Internal communication memo (n.d.) below:

> Guidelines for online Instruction stipulates that lectures in the department teaching a unit online should: (a) provide (online) the students taking the unit a course outline; (b) co-ordinate the lecturers teaching the same unit in other digital school in regional centres with regard to the course outline, tutorials, CATs and Examinations; (c) administer Face to Face tutorials to students taking the unit; undertake (online): 2 quizzes, one assignment in the unit taught, 2chats and 4 discussion forums; (d) responsible to questions, clarification or issues raised by students taking the unit; (e) administer and make online assignments of the students taking the unit and vii] submit examination marks and scripts within the stipulated time frame.

This framework does not embrace a clear policy guided by principles of eLearning namely: establishing Learner Knowledge; Staff Commitment to eLearning; Resources Available and Time Available for the eLearning processes

A departmental ad hoc committee report on eLearning issues that must be attended to when implementing an eLearning Policy that can work outlined the following challenges that compound effective implementation of an eLearning Policy (Ondigi, 2015) namely:

1. Infrastructure: There is need to have a complete infrastructure to fully support the eLearning endeavours
2. Resources: Availability and easy access to the resources such as computers, modems and all full net-working, internet connectivity, time among others are necessary,
3. Mode of delivery: This must be clearly expressed for there is need for a uniform mode of delivery, e.g. lecture by lecture mode or whole unit mode in online learning,
4. Capacity building of staff: The academic staff, students, and technicians need the skills if the learners have to gain from eLearning,
5. Authorship of Content: It should be clarified whether the content is the property of the author or University. If it is for the University to own it, then it has to pay well to the authors of the content. Any uncompromising process on this point is bound to produce sub-standard products.
6. Skills building instruction: Respective departments in the university have their mandate and role to play in the education system, for example, the department of educational Communication and Technology is tasked with the training of teachers on

pedagogy in regard to delivery of subject content in the classroom which cannot be done through eLearning. The department of pedagogy, which is a skills department, requires face-to-face training and integration of ICTs while other forms of learning can be managed by use of eLearning. Apparently, the pedagogy department trains teachers on how to integrate technology in the classroom and does emphasize on blending technology in teaching and learning.

7. Finally, Policy on eLearning: There is need to come up with a policy to guide the schools and departments in an institution on the general policy on eLearning. The policy should include: standards, awards and rewarding systems for the lecturers, and uniformity in the structure on eLearning.

It is further argued that established Principles of the eLearning Policy and their Context must provide for the following if effective integration of ICT in training is to be provided to the teacher trainees during the training **(**An eLearning Policy for Staffordshire University, 2004):

Principle 1: The University should ensure that its eLearning provision could meet the needs of a full range of flexible and independent learning experiences. This will include on and off campus learners in local, regional, national and international settings and cover both blended and fully eLearning courses ranging from full awards to informal and individual learning.

Principle 2: The University should ensure that students taking eLearning courses have equity of opportunity with those taking courses delivered in more traditional ways, and that its marketing, recruitment, administrative and support procedures and provision are fully aligned to the needs of the eLearner.

Principle 3: The University should continually work towards ensuring that all systems, both manual and electronic, used in the eLearning context interoperate in the most effective way to provide learners with an effective and increasingly individualised learning environment encompassing all aspects of their experience as a student of the University, as part of a holistic Managed Environment for Learners (MEfL).

Principle 4: The University should exploit the range of technologies used in the eLearning context to work with partner organisations, employers and individuals to assist it in meeting its goals of supporting the independent and lifelong learner and continuing professional development.

Principle 5: The University should ensure that as far as possible, resources for both tutors and learners, including eLearning course content, University eResources, and those provides from external sources are easily accessed from point of need. In addition, it will via the use of managed repositories, ensure that University owned eContent and eResources are readily available for repurposing and reuse by those entitled to do so, and will thus actively support cross discipline and Faculty developments.

Principle 6: The University, through its quality processes, should ensure that eLearning provision meets the standards expected by the University, funding bodies and relevant legislation, and that it is accessible, educationally sound, engaging and appropriate to its target populations, whilst ensuring that course developers and those facilitating learning have the scope to innovate and fully employ their professional skills and judgement.

Principle 7: To ensure that the potential of eLearning to innovate learning and meet the needs of an increasingly diverse range of potential learners is realised, the University will actively encourage research, scholarship and development in all aspects of eLearning, and in particular, pedagogy for eLearning. In addition, it should, via appropriate staff development, ensure all management, administrative, support and teaching staff has the skills, and understanding of each other's roles, required to play their part effectively in the provision of eLearning.

Principle 8: The University should monitor and evaluate the use of all systems and practices contributing to its learners' eLearning experiences, to ensure that practice, policy and strategy are responsive to lessons learned and agile in respect of new opportunities, and will actively seek to remove barriers that impede or restrict effective eLearning.

Principle 9: The University should ensure, assist by the use of monitoring and evaluation, that the resources required to support eLearning, in human, technical and infrastructural aspects, are appropriate to its requirements and will allow it to provide its eLearners with realistic definitions of the levels of service they can expect, and

Principle 10: The University should ensure that, by using effective costing models and market research, the pricing of eLearning offerings is both competitive and appropriate to the target populations.

Therefore, a well-articulated eLearning pedagogical policy for implementation should consider questions like:

1. Who are the learners undertaking the programme, in which case the teacher training programme will require face to face training since it is hands-on experiences?
2. What are the learner characteristics and demographics in regard to the new ventures of teacher training for the job-market requires employees who are responsive to changes in society?
3. How do they prefer to access their learning and what is the practice during the training and in the job-market?
4. Why are they enrolling in the eLearning programme?
5. What special needs might they have to be able to do their profession more efficiently and effectively in today's world of work?

Problem Statement

The authors of this paper believe that a university policy on eLearning pedagogy is one that provides guidance on the use of eLearning where appropriate to support the achievement of its goals in providing learner-centred learning experiences that are flexible, responsive and effective to meet the needs of all its learners in the society long after schooling and as then best fits the job-market requirements. The element of eLearning is used to innovate both learning and its delivery mechanisms that make effective and efficient use of all resources whilst maintaining the quality standards the university is committed to in upholding global image since the student teacher trainees can opt for jobs where available.

Where an institution proposes to implement an eLearning pedagogical approach for training teachers, it must use a holistic policy initiative that caters for the interest of all parties involved in the processing of training and learning skills that can be used for in content delivery in the classroom. Therefore, the instituted policy should stand the challenges of modern times in the preparation of student teachers for purposes of effective and efficient delivery of content in the classroom. This study therefore addresses the issue of formulation and implantation of eLearning policy for effective and efficient training of student teachers who can handle content in the classroom in this 21st century.

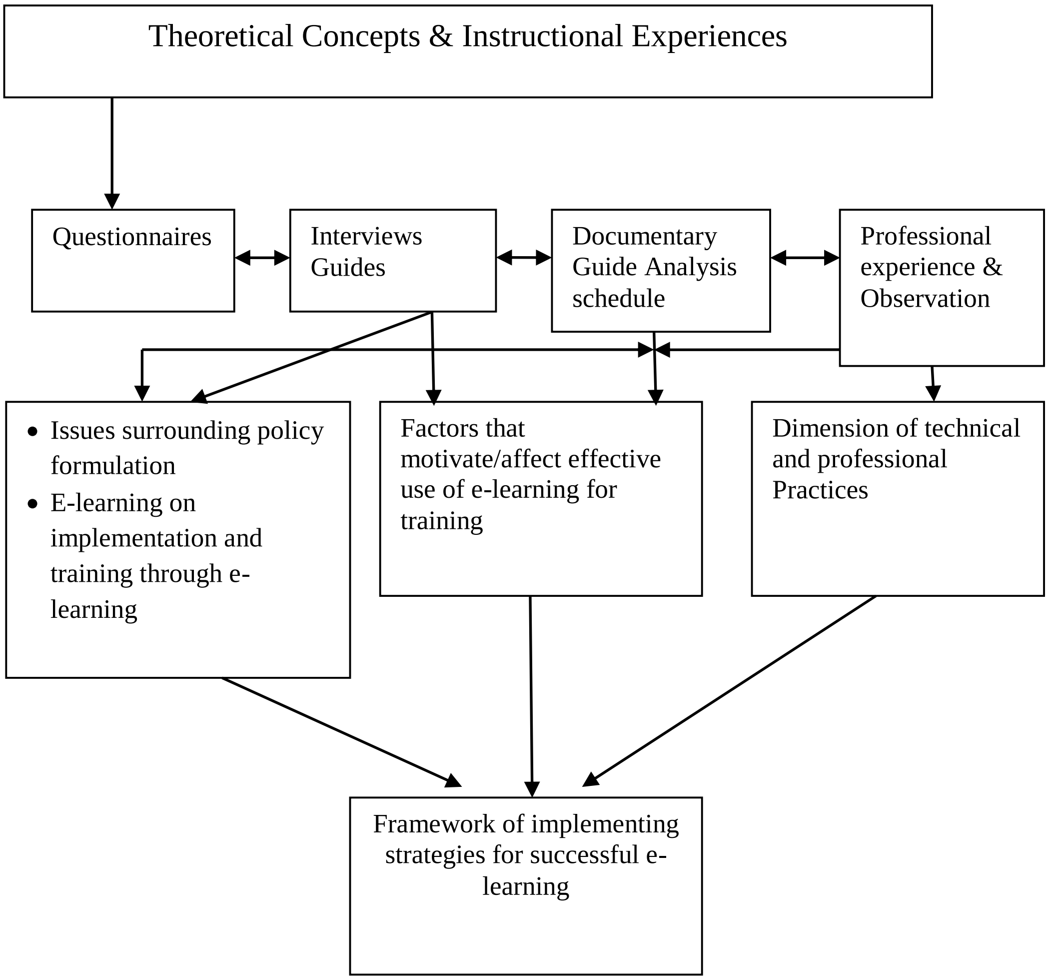
The Specific Objectives

The specific objectives of this study were to: (a) To identify university policy on e-learning as a tool for training, (b) Establish the implementation policy on e-learning as a training tool, (c) Establish the training challenges experienced in implementing the policy and (d) Development model on the implementation of e-learning as a tool for pedagogical training.

Methodology Used in the Study

This study was guided by the Human Capital formation and knowledge acquisition theories. The study used an exploratory design to investigate the state of formulation and implementation of eLearning pedagogical policy for teacher training whereby the authors considered four issues as adapted from Awidi (2012) in figure 1below:

Figure 1: Showing Research Design on eLearning Pedagogical Policy Formulation and Implementation



The study targeted 100 graduate student teachers and 23 lecturers in the Department of Educational Communicational and Technology that is responsible for training skills development. The study used three sets of instruments including: questionnaires for graduate student teachers and lecturers; interview guideline for dean of the school of education and a documentary analysis guide to collect data. Descriptive analysis was used to analyze and summarize the views of the respondents and reporting was done using figures and tables.

Reporting and Discussion of the Findings of the Study

The findings of this study indicate that the question of formulation of eLearning policy is very critical in making decisions about eLearning pedagogical training and development of skills to classroom teachers. When the respondents were asked to identify university policy on e-learning as a tool for training of teachers, their responses were as shown in table 4.1 below:

Table 4.1 Responses on Formulated University of eLearning Policy	Lecturers				Students			
Statements	SA	A	D	SD	SA	A	D	SD
5. There is a clear university policy on e-learning	3	2	12	6	10	7	39	6
6. The established e-learning policy is working well for me	1	4	15	3	2	8	41	12
7. The e-learning policy has been explained to me for my training	2	2	10	9	6	4	18	35

The responses by the Lecturers indicate that 18/23 (78.2%) that the university policy on eLearning was not clear. Majority of the graduate student teachers 45/63 (71.4%) said the policy was not made clear to them either. Further, both respondents lecturers 18/23 (78.3%) and graduate student teachers 53/63 (84.1%) claimed the established eLearning policy does not work well for them, while lecturers 19/23 (82.6%) and graduate student teachers 53/63 (84.1%) claimed the eLearning policy had not been explained to them. The Policy that guides the use of eLearning for training teachers should provide a clear framework on the implementation that will not compromises the existing practices (Donnelly et-al, 2011; Ondigi et-al, 2015 and National Research Council, 2000).

The policy on eLearning though good it falls sorts of realizing that some departments are skills oriented and thus use of eLearning as a prime course of training will limit the student teachers. A classroom teacher needs skills on how to handle content and this is best done through face to face. The respondents' were asked to indicate their opinion about training through eLearning and their responses are as indicated in table 4.2 below where both lecturers and graduate student teachers preferred face to face training as opposed to eLearning pedagogy.

Table 4.2 Responses on eLearning Policies for training skills	Lecturers				Students			
Statements	SA	A	D	SD	SA	A	D	SD
8. I have enough exposure to e-learning in my department	3	4	9	7	5	10	32	16
10. I prefer face to face training with my lecturers for skills development	14	1	2	6	22	20	19	12
11. I have access to e-learning resources in the department	3	5	14	1	7	11	21	24

The respondents, that is, Lecturers 16/23 (69.6%) and graduate student teachers 48/63 (76.2%), had no enough exposure to eLearning. Yet Lecturers 15/23 (65.2%) and graduate student teachers 42/63 (66.7%) preferred face-to-face training for skills development. Whilst, Lecturers 15/23 (65.2%) and graduate student teachers 45/63 (71.4%) said they didn't have access to eLearning resources in the department. The use of the documentary analysis schedule to identify the existing infrastructure, the availability and access to eLearning resources in the department revealed that there are no adequate ranges of eLearning resources that can sustain a comprehensive training programme. The expectations of access and availing the following eLearning resources namely: computers and soft wares; high speed internet connectivity; media lab, recording studio for audio and video technologies; audio-video equipment, media science labs and equipment; human resource, that is, both technical and human knowhow were exceedingly lacking for an effective eLearning approach for training teachers.

Further the lecturers' views about eLearning pedagogy on training of teachers were sought and these are indicated in table 4.3 below:

4.3 Lecturers views about eLearning Poly	**Lecturers**			
Statements	SA	A	D	SD
13. I am competent in ICT integration for training pre-service teachers	5	13	4	1
14. e-learning can achieve much in training of pre-service teachers	8	13	2	1
15. Use if e-learning in training pre-service teachers is time consuming	9	10	4	0

The results indicate that Lecturers 18/23 (78.3%) are competent in ICT integration for training teachers; while 21/23 (91.3%) agreed that eLearning can achieve much in the training of teachers and 19/23 (82.6%) indicated that the use of eLearning in the training of teachers is time consuming. This is due to high enrolment levels in the department and a depleted staff to handle the large classes. Measures of ensuring that the learning environment is favourable and all mechanisms are put in place to support the eLearning processes should be clearly provided for and evidently subjected to rigorous attempts of certainty to meet international standards (Ondigi et al, 2015; Quality Assurance Task Force, 2006; Schon, 1983).

Some of the reasons the Lecturers gave for not preferring eLearning Pedagogy were as indicated in table 4.4 below:

Table 4.4 Lecturers reasons for not preferring the eLearning Policy	**Lecturers**			
Statements	SA	A	D	SD
8. My department is supportive of the e-learning policy used in training teachers	3	4	9	7
10. e-learning resources are adequate in the department	2	6	14	1
16. Face to face training of pre-service teachers is effective and efficient	7	13	2	1
17. Pre service teachers have limited competences in e-learning	8	14	0	1
18. Use of e-learning is quite challenging in class	6	13	2	2
19. My department has enough e-learning resources	2	2	10	9
20. e-learning technology is expensive and time consuming	3	2	4	14

The results indicate that Lecturers 16/23 (69.6%) said the department is not supportive of the eLearning policy; 15/23 (65.2) said eLearning resources are not adequate; 20/23 (87%) indicated that face to face is effective and efficient; 22/23 (95.7%) said trainees have limited competences in eLearning; 19/23 (82.6%) indicated use of eLearning is quite challenging in class; 19/23 (82.6%) indicated the department doesn't have enough eLearning resources and 18/23 (78.3%) said eLearning technology is expensive and time consuming. There is need for understanding and cooperation among lecturers, student trainees and the university on ways of implementing the eLearning policy for Boyer (1990) stress on reconsidering the priorities of professionals, the beneficiaries and society which is to benefit from the processes of educating.

As for graduate student teachers' opinion about eLearning policy, their responses are as indicated in figure 4.5 below:

Table 4.5 Graduate student teachers' opinion about eLearning Policy	**Graduate Students**			
Statements	SA	A	D	SD
13. Integration of ICT in teaching contents is all necessary in my profession.	36	14	9	6
15. Time element is of essential in e-learning	38	14	8	3
18. Use of e-learning will be challenging in class	33	16	9	5
21. Integration of ICT will suffice e-learning	19	30	8	6

The results indicate that the graduate student teachers 50/63 (77.4%) agreed that integration of ICT in teaching content is all necessary in their profession. The respondents further indicated 52/63 (82.5%) that time element is of essence in eLearning, and 49/63 (77.8%) showed that use of eLearning would be challenging in class while 49/63 (77.8%) said that integration of ICT would suffice eLearning. The integration of technologies in training is compounded by lack of technological knowhow, availability and accessibility of the eLearning resources, attitude to usage of the technologies and institutional support (Gonzalez, 2010, 2012; Grabe, 2001; Liu, 2011; Mumtaz, 2000).

Some of the reasons graduate students gave for not liking the policy on eLearning pedagogy are as shown in figure 4.6 below:

4.6 Graduate students' reasons for not liking the eLearning Policy	**Graduate Students Teachers**			
Statements	SA	A	D	SD
14. I do not have enough skills in e-learning	19	28	5	8
16. I handle content better through face to face	23	31	5	4
17. Students must have competence in e-learning	41	10	8	4
19. My department is not well equipped for e-learning at the moment	36	14	10	3
20. e-learning technology is expensive and time consuming	28	13	6	11

The results indicated that 47/63 (74.6%) of the graduate student teachers accepted they didn't have enough skills in eLearning; 54/63 (85.7%) said they handle content better through face to face; 51/63 (81%) argued that students must have competences in eLearning for one to use it. Majority 50/63 (79.4%) indicated the department is not well equipped for eLearning at the moment and 41/63 (65.1%) indicated that eLearning is expensive and time consuming. When thinking about the pedagogy of university teaching, it ought to be clear what the policy on eLearning is, why it is necessary to adopt it in pedagogical training and the consequences should be comprehended (Deeson, 2006; Gonzalez, 2009, 2012).

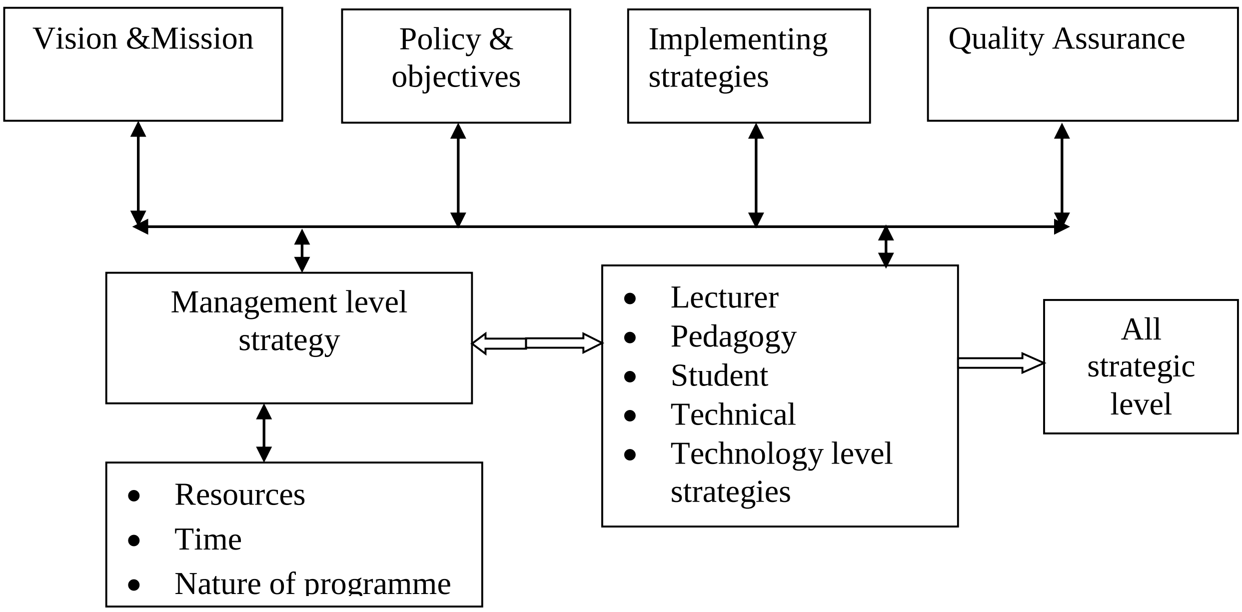
When respondents were asked what they felt about the implementation of policy on eLearning as a training tool for training skills to the graduate student teachers, their responses are as shown in table 4.7 below:

Table 4.7 Respondents' views on Implementation of eLearning Policy	**Lecturers**				**Students**			
Statements	SA	A	D	SD	SA	A	D	SD
9. I train graduate teachers face to face for skills development	8	13	1	1	-	-	-	-
12. Face-to-face training equips me better for my teaching	6	11	4	2	-	-	-	-
9. e-learning policy needs ample time to implement	-	-	-	-	16	31	14	2
12. Face-to-face training equips me better for my teaching	-	-	-	-	27	23	10	3

The Lecturers 21/23 (91.3%) indicated they train teachers face to face for skills development and 17/23 (73.9%) indicated that face to training equips them better for their teaching and training of teachers. On the other hand, graduate student teachers 47/63 (74.6%) indicated that eLearning policy needs ample time to implement; while 50/63 (79.4%) said that face-to-face training equips them better for their teaching. Hence, this makes policy implementation challenging among the users of the facility (King et al., 2000; Mahmud & Gope, 2009).

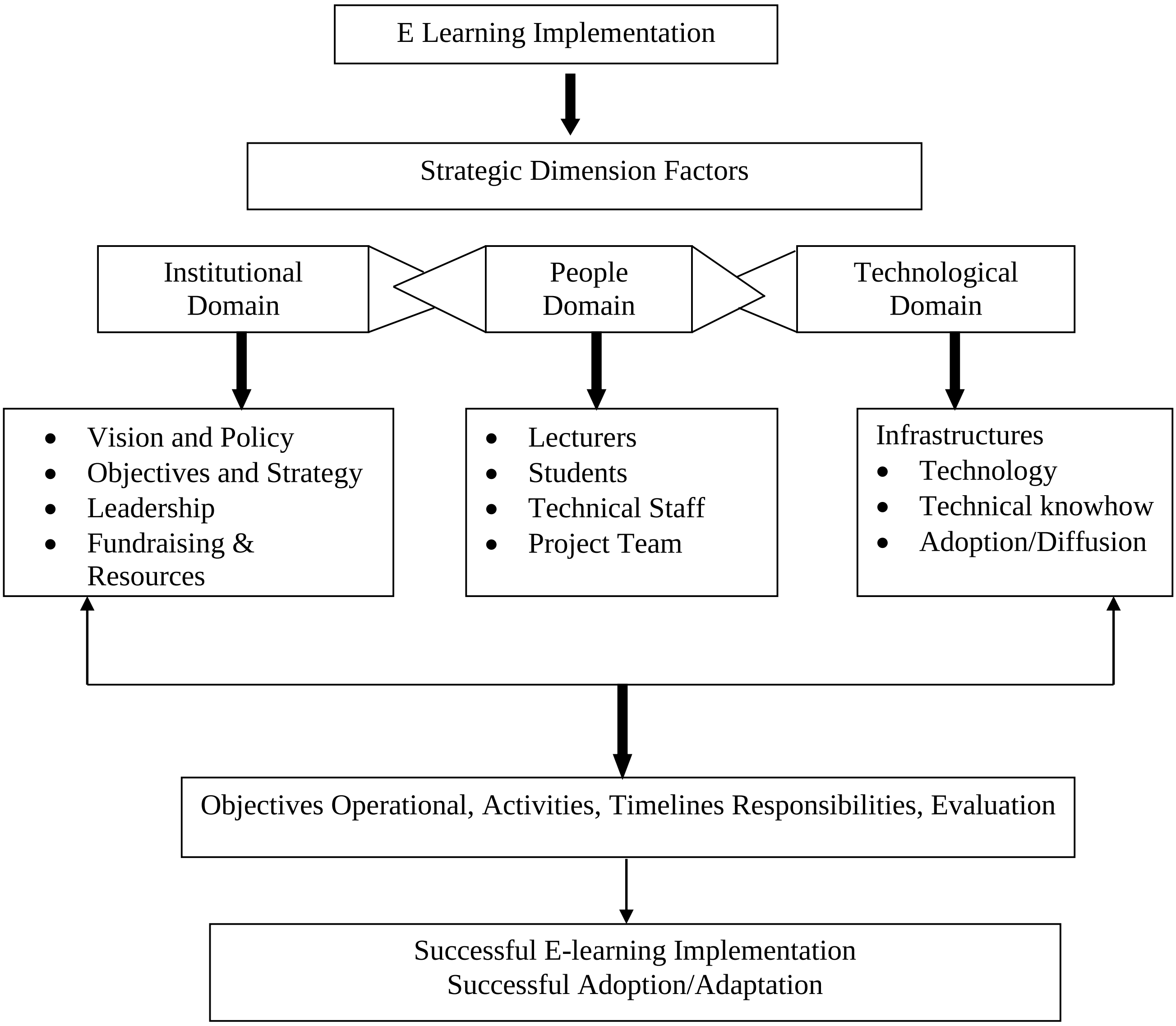
According to Awidi (2012), a good implementation policy for eLearning training could be as illustrated in figure 2 below:

Figure 2: A Proposed eLearning Formulation and Implementation Strategy for Gainful Training and Learning



In essence, the integration of ICT in the teachers' training programmes ought to focuses on incorporating essential subject content, knowledge from their particular disciplines and also requires more hands-on practice on using ICT in their particular disciplines. Ordinarily, the teachers' ability to use ICT in their administrative activities is not a condition to successful integrate ICT in teaching. However, Bingimlas (2009) argues that the development of proper pedagogical knowledge and its appropriate application to ICT are considered to be more crucial than the technical ability of using ICT. Thus, a good framework for implementing an eLearning strategy will involve the steps adapted from Awidi (2012) outlined in figure 3 below:

Figure 3: Showing the eLearning Implementation Policy



According to Callan and Bowman (2010), the effectiveness to implement a good eLearning policy will greatly depend on a sound framework of the toolkit that is based on project management processes, the ADDIE (analyse, design, develop, implement, evaluate) instructional design model and research into factors that sustain e-learning. According to this Koehler and Mishra model on ICT integration, institutions undertaking teacher training should provide better access to resource materials that relate to the subject content and other related resources relevant to training of skills that the teacher trainees require (Koehler & Mishra 2005). Similarly, Grabe (2001) reiterates that the integration of ICT should be involved in the process of teaching in every subject and in every classroom, because of the very fact that ICT facilitates students' engagement in problem solving activities; decision-making to improve their thinking skills.

When respondents were asked to indicate the challenges to the implementation of eLearning policy in their institution of learning, their responses are summarized in table 4.8 below:

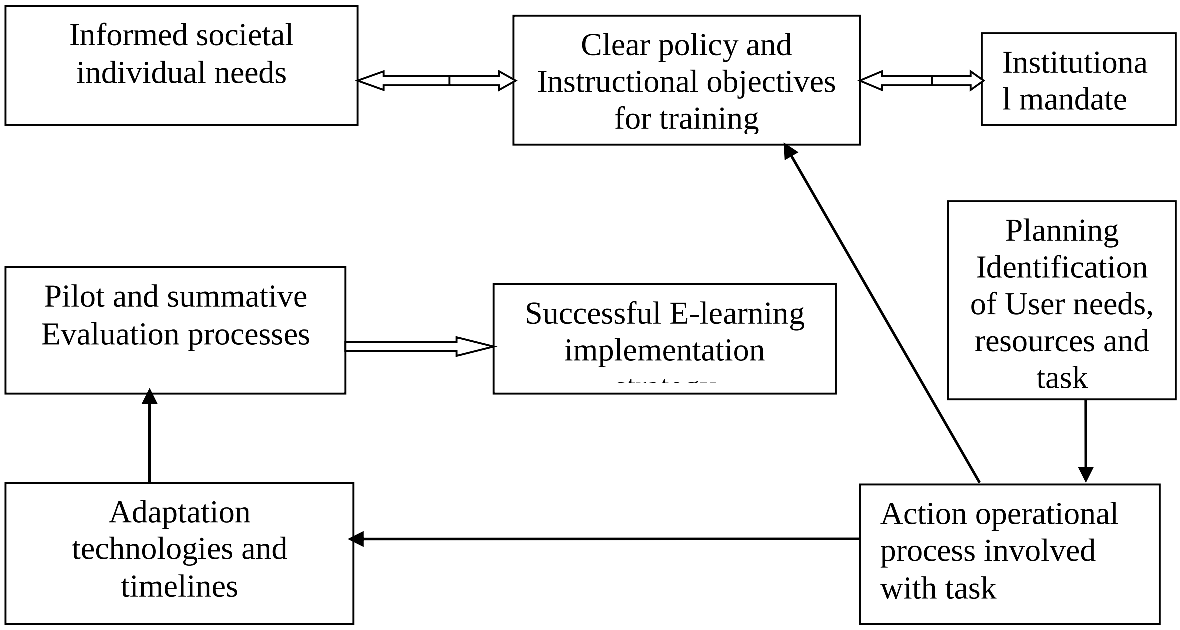
Table 4.8 Challenges Facing Implantation of eLearning Policy

Serial #s	Challenges to the Implementations of eLearning Policy and training	Solutions to the challenges on Implantation of eLearning policy and training
i	Lack of a clearly established policy and guidelines to provide direction in training	Proper policies and guidelines be established and provided as necessary
ii	Lack of adequate eLearning facilities to provide a comfortable learning environment	Establish adequate facilities for use as and whenever necessary by both the academic staff and students
iii	Lack of technical manpower to train and guide the users of eLearning facilities	Establish a pool of resourceful manpower in the eLearning centers
iv	Lack of organized eLearning programme management personnel	Source and equip the facilities for full utilization of the resources available
v	Lack of established promotional processes, e.g. workshops/seminars	Establish regular staff training workshops/seminars
vi	Low rewarding system for innovativeness among staff and students	Reward talents for effort and time put in eLearning
vii	No adequate eLearning equipment and resources in the departments and schools	Purchase eLearning equipment and train staff and students on development of eLearning resource
viii	Lack of proper communication channels in the hierarchy of commanding	Develop good communication channels and have consensus on operations of eLearning
ix	High student enrolment that increases the lecturer- student ration	Have enough staff to make eLearning effect by reducing lecturer-student ration
x	Attitude towards eLearning as held by Lecturers and students	Sensitize both lecturers and students on the advantages of eLearning
xi	Lack of access to eLearning resources	Expand accessibility in terms of facilities, equipment,, time and points of accessibility to the internet connectivity

Evidently so, research has shown that despite these challenges experienced in eLearning approaches, teacher trainers can use ICT to facilitate student-centered active learning and to engage students in collaborative learning that enhance their social interaction not only in the classroom but beyond the classroom rims so as to improve their cognitive development, increase creativity, as well as improved problem solving skills among learners (Khan, 2014; Okojie et al., 2006; Khan, Hasan & Clement, 2012). The pedagogy of technology integration should be clear to those engaged in the processes of training (Jung, 2015; Perry & Johnson, 2004).

According to the findings of this study, a more workable model for eLearning as a tool for pedagogical training is as adopted from Awidi (2012) and presented in Figure 4 below:

Figure 4.4 Showing: A Workable Model for Use in the Training of Graduate Student Teachers



Conclusion

The findings of the study indicate that with this increasing transformation in the society and the education sector that propels this change, teacher-training institutions should rethink their role in imparting knowledge and skills to the teachers who deliver content in the classroom. Ideally, universities need to invest in adequately in preparing their teachers for the changes in society through a transformational approach than a transactional approach to eLearning strategies. Afshari et al. (2009) acknowledges that the teachers' academic and professional development becomes an integral part of any successful technology and education-training program. Second, universities need to invest adequately in identifying comprehensive and effective teacher training programmes that ensure both Lecturers and teacher trainees attain clear skills in the integration of ICTs and where appropriate realize some eLearning strategies that are relevant to their specializations. According to Ramsden (1992) both the trainers and the trainees need to possess knowledge of how the subjects are best learned and taught in schools.

The established policies on eLearning approaches should ensure the programmes have a potential to influence on how effectively ICT can be integrated in the teaching-learning situation and not online training that replaces the classroom teacher. Essentially, ICT integration in teaching and learning has a great impact on student learning much more than eLearning that would only be limited to those with access to technology. Further, complexity and inappropriate training of teachers compound the integration of technology in education. Under these circumstances, the proposed simple model in figure 4 would open up new experiences, inspiration or blessings for eLearning pedagogical training in our institutions of learning. In order to make this model effective for teacher training programs, the above stated model strategies should be carried out to eliminate the constraints and accelerate the provision of all possibilities to improve quality of teacher training in universities. This study already recognizes that ICT in education is a comparatively new arena in Kenya and educators as well as learners should move cautiously to realize the much anticipated benefits of technology and eLearning in particular and as supported by research works (Khan, Hasan & Clement 2012; Banu, 2012) for the barriers to implementing technology in the developing worlds are enormous.

References

Afshari, M, Bakar, K.A, Su Luan, W, Samah, B.A.& Fooi, F.S.(2009). 'Factors affecting teachers' useof information and communication technology', *International Journal of Instruction*, vol. 2,no. 1, pp. 77-104.

An eLearning Policy for Staffordshire University (2004.). http://www.col.org/progserv/policy/pages/e-learning.aspx downloaded on 22nd may 2015.

Australian Flexible Learning Framework, (2011). E-assessment guidelines for the VET sector. http://flexiblelearning.net.au/tools-and-resources/assessment/ downloaded on 4th march 2015.

Awidi, I.T. (2012). E-Learning Implementation Strategy for ICT Challenged Environment. http://ro.ecu.edu.au/crje/3 (downloaded 0n 3rd june 2015).

Callan, V and Bowman, K,(2010). Sustaining E-learning Innovations: A review of the evidence and future directions. http://flexiblelearning.net.au/about/research/ downloaded 5th may 2015.

Carver, Larry. (n.d.) Proposal for adaptation of online course development and guidelines. Hutchinson Community College. Retrieved June 10, 2006, from http://www.hutchcc.edu/itde/staff/larry/TaskforcePaper.htm

Chickering, A. W.,& Ehrmann, S. C. (1996). Implementing the seven principles: technology as a lever. *AAHE Bulletin*, 36.

Banu, S, (2012), 'Teachers readiness for computer education classes in the secondary schools of Bangladesh', *Bangladesh education journal* vol. 11, no. 1.

Bingimlas, K.A.(2009).*Barriers to the Successful Integration of ICT in Teaching and Learning Environments: A Review of the Literature*, vol. 5, EURASIA. http://www.ejmste.com

Boyer, E.L. (199). Scholarship Reconsidered: Priorities of the professionate. The Carnegie foundation for the Advancement of Teaching.

Deeson, E.(2006). Technology, e-learning and distance education – A W (Tony) Bates', *British Journal of Educational Technology*, vol. 37, no. 6, pp. 975-976.

Donnelly, D.; McGarr, O.& O'Reilly, J.(2011). A framework for teachers' integration of ICT into their classroom practice, *Computers & Education*, vol. 57, no. 2, pp. 1469-1483.

Flexible Learning Advisory Group, 2013, 2013 E-learning Benchmarking Survey. http://flexiblelearning.net.au/about/research/

González, C.(2009). Conceptions of and approaches to, teaching online: a study of lecturers teaching postgraduate distance courses', *Higher Education*, vol. 57, no. 3, pp. 299-314.

González, C (2010). What do University teachers think eLearning is good for in their teaching?', *Studies in Higher Education*, vol. 35, no. 1, pp. 61-78. [6/6/2015].

González, C. (2012). The relationship between approaches to teaching, approaches to e-teaching and perceptions of the teaching situation in relation to e-learning among higher education teachers', *Instructional Science*, vol. 40, no. 6, pp. 975-998.

Grabe, M (2001)*Integrating technology for meaningful learning / Mark Grabe, Cindy Grabe, 3rd*ed. edn, Houghton Mifflin, Boston .

Gonzale Z. (2009). Conceptions of and approaches to teaching postgraduates online.

Gonzale, Z. (2010). What do Universities teachers think eLearning is good for their teaching.

Gonzale, Z. (2012). The relationship between approaches to and eLearning and perceptions

Jung, I (2005). 'ICT-Pedagogy Integration in Teacher Training: Application Cases Worldwide', *Educational Technology & Society, 8 (2), 94-101.*

Khan, S.H. (2014). A model for integrating ICT into teacher training programs in Bangladesh based on TPCK. *International Journal of Education and Development using Information and Communication Technology(IJEDICT)*, Vol. 10, Issue 3, pp. 21-3.

Khan, S.H., Hasan, M.& Clement, C.K . (2012). 'Barriers to the introduction of ICT into education in developing countries: the example of Bangladesh ', *International Journal of Instruction*, vol. 5, no. 2, pp. 61-80.

King, J., Nugent, G., Russell, E., Eich, J. & Lacy, D. (2000). A policy framework for distance education: implications for decision makers. *Distance Learning Administration*, 3(2).

Retrieved June 1st 2015, from http://www.westga.edu/~distance/king32.html

Koehler, M.J.& Mishra, P.(2005). 'What Happens when Teachers Design Educational Technology? The Development of Technological Pedagogical Content Knowledge', *Journal of Educational Computing Research*, vol. 32, no. 2, pp. 131-152.

Liu, S.H.(2011). 'Factors related to pedagogical beliefs of teachers and technology integration', *Computers & Education*, vol. 56, no. 4, pp. 1012-1022.

Mahmud, K & Gope, K (2009). 'Challenges of Implementing E-learning for Higher Education in Least Developed Countries: A Case Study on Bangladesh', in *Information and Multimedia Technology, 2009. ICIMT '09. International Conference on*, pp. 155-159.

Mumtaz, S. (2000). 'Factors affecting teachers' use of Information and Communications Technology:a review of the literature', *Journal of Information Technology for Teacher Education*, vol. 9,no. 3, pp. 319-342.
National Research Council (2000). How People Learn: Brain, Mind, experience and school. Washington DC: National Academy Press.
Nicoll, K. & Harrison, R. (2003). Constructing the good teacher in higher education:The Discursive work of standards. Studies in Higher education, vol. 25, No. 1 pp. 23 – 35.
Okojie, M.C.P.O.; Olinzock, A.A.& Okojie-Boulder, T.C.(2006). 'The Pedagogy of Technology Integration', *Journal of Technology Studies*, vol. 32, no. 2, pp. 66-71.
PerryJohnson,A. (2004). Regents recognize 'best practices' within university system. Retrieved May 30th 2015, from Board of Regents of the University System of
Georgia Web site http://www.usg.edu/news/2004/111704.phtml Quality Assurance Task Force (2006).Quality Assuarance Policy. Makerere University.
Ramsden, P. (1992). Learning to teach in higher education. London: Routlrdge.
Schon, D.A. (1983). The Reflective Practitioner: How professionals think in action. London Temple Smith.
Sife, A.S.; Lwoga, E.T. and Sanga, C. (3007). New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. International journal of education and development using Information Technology. vol. 3 issue2 pp. 57 – 67.

INTEGRATION OF ICT IN THE TEACHING OF BIOLOGY – A CASE OF SELECTED SECONDARY SCHOOLS IN MUMIAS SUB COUNTY

Bernard Ong'amo
Kenyatta University

Samson Ondigi
Kenyatta University
ondigi@yahoo.com

John Maundu
Kenyatta University
maundujohn52@yahoo.com

Integration of technology in teaching and learning conforms to 21st century developments where global information is now readily accessible to the populace. Information communication and technology (ICT) is interactive and its non-linear properties highlighted by the hypertext techniques support the construction of knowledge. The hypertext method requires the renewal of the teaching techniques, the student being more active in their apprenticeship. This is in line with inductive method of teaching which is learner based unlike the deductive method where a teacher is the sole proprietor of knowledge in the classroom. This paper explores the extent to which ICT is integrated in teaching and learning in secondary schools in Mumias Sub-County to enhance Biology content delivery. The objectives of the study were to establish teachers ICT level, extent of ICT usage, support structures available for ICT usage, challenges faced by teachers in ICT integration in the teaching of Biology and strategies used by teachers to overcome the challenges. The rationale is based on the premises that use of ICT renders activity of the teacher more efficient, teacher- student relationship more lively and learning interesting. The study used descriptive survey design and was carried out in secondary schools in Mumias Sub-County-Kenya. The target population is 46 secondary schools. Stratified random sampling was used to select four counties and one private school that embrace ICT in their teaching and learning of Biology. This represents 10% of the schools in the Sub-County. Data was collected using questionnaires as the main instrument of data collection. Interview schedule for head teachers and classroom observation schedule was also used to give first hand information about ICT usage in the schools. Analysis of data was done using descriptive statistics and inferential statistics. Presentation was done by use of tables, percentages, charts, graphs and frequencies. The findings will exemplify what needs to be done in order to make teaching and learning of Biology more interesting and effective to enhance student performance in the subject.

Key words: Integration, Innovation, Pedagogy, INSET, Software, Hardware, Multimedia

Background and Rationale of Study

The 21st Century teachers have to cope with the advent of knowledge based economics that demand that they not only understand innovation but that they also increase their capacity to manage it (Cumming and Owen, 2006). The Innovative teaching and learning practices provide students with learning experiences that promote 21st Century skills characterized by knowledge building, problem solving, skilled communication, collaboration, self regulation and use of ICT for learning (Shear, L et al, 2009). Integration of ICT in teaching and learning is increasingly becoming an important agenda in educational reform initiative. The potential value of ICT in enhancing quality learning experiences and transformation of pedagogy are some of the factors driving ICT integration in teaching of Biology (Mc Nair and Galanouli; 2002).

With the advent of the World Wide Web there are now new tools and learning procedures that support development of such skills. Information Communication and Technology could prove to be advantageous in understanding of concepts in Biology because of their interactive and non- linear properties, highlighted by the hypertext technique that supports construction of knowledge. The educational reforms currently sweeping many countries in the world has created enormous challenge, confronting the countries with the need to rethink their educational and social systems (Kozma, 2005). Instructions in Science in the 21st Century must be oriented to meet the challenges of covering the entire population in promoting scientific literacy. Biology, a component of science discipline is best taught by incorporating teaching and learning resources including ICT as media resource. ICT is an essential entity as it replaces essential passivity of students in class with an active learning mode stimulating interest, curiosity resulting in students' involvement in the teaching and learning process. Biology teachers are the hubs in this endeavor and therefore a thorough understanding of the ICT integration in the subject is a pre-requisite to improvement in the instructional process. To be an effective innovative teacher, educational programs suitable to meet the exigencies of 21st Century has to be undertaken. According to Groove, J.W (2005) effective teachers are reflective practitioners who amplify the qualities of learning to inspire students and continuously critique the impact of their teaching colleagues and school community. Furthermore, the 21st Century teacher should understand learners' pedagogical problem areas in taught subjects like Biology.

At the moment there is unprecedented amount of training at all educational levels on the use of technology in an effort to improve pedagogical teaching of difficult concepts in various subjects (Monteith, 2006). Moreover Darling Harmond (2006) advocates for adequate training of teachers in order to equip them with the 21st Century skills on "what and how" to teach knowledge thus enabling them to become adaptive experts who can continue to offer quality education. Boaduo (1988) and Lawal (2006) concurs but observes that no nation develops beyond the quality of its education system, which is highly dependent on the quality of its teachers. Teachers should acquire the most appropriate tools during training such as subject content, pedagogical methods and skills of knowledge transmission to be able to do their work professionally. Biology is an interconnected body of knowledge and teachers must motivate learners to make connections between knowledge and its application in life through improved pedagogical practice as science subjects are best taught and learned in the context of daily life, technology and community or society. Concepts are internalized through discovery and timely reinforcement of acquired knowledge. Robler and King (1988) consider an increase of approximately 10% in time for learning as an important gain when using computer applications such as computer- assisted instructions. To improve on pedagogical teaching of difficult topics, biology teachers need exposure to powerful conceptual frameworks to help them organize instructions and analyze classroom events otherwise they may fail to grasp new concepts about teaching and learning or they may learn them for the purpose of test, but revert to their perceptions later (Darling- Harmond and Bransford 2005). A well-versed and technologically sound teacher will create a culture of inquiry in his/ her class. Today Biology students must be seen in a new context; first as facilitators, teachers must maintain students' interest by helping them see how what they are learning will prepare them for life in the real world. Second, as collaborators in the learning process, instructors must instill curiosity in learners, which is fundamental to lifelong learning. Third, facilitators must act as partners in the learning process and be flexible in how they teach. Fourth, they must excite learners to become even more resourceful so that they can continue to learn outside the formal school system.

Concept of ICT

Information Communication and Technology (ICT) is commonly defined in Education as a diverse set of technology tools and resources used to communicate, create, disseminate, store and manage information (Brurton 2003). These technologies include computers, Internet, broadcasting technologies (Radio and Television), mobile (Telephony) digital cameras and software (such as E-mail discussion forums). The term ICT has had a long history in the evolutionary process. According to Pelgrum and Law (2003), towards the end of 1980s the term computer was replaced by IT (information technology). This signified a shift of focus from computing technology to computer-enhanced capability to store and retrieve information. This was followed by the introduction of the term `ICT` around 1992 when E-mail started becoming available to the general public. ICT according to Wikipedia is often used as an extended synonym for information technology (IT) but is a mode specific term that stresses the role of unified communication and the integration of telecommunication (telephone lines and wireless signals) computer as well as necessary enterprise.

Today the term ICT is applied to a set of technological tool and resources having immense potential to improve student-learning outcome when properly used (Wang, 2001). In the past ICT was viewed as presence of computer capable of facilitating mathematical and scientific tasks. In Kenya the difficult combinations of technologies are used rather than a computer as a sole delivery mechanism.

Concept of ICT Integration in Teaching and Learning of Biology

The potentiality of ICT tools are recognized in the role they play in accelerating the paradigm shift from traditional learning (teachers centered) to construction (students centered innovation) learning. According to Morton (1996) computer should not be seen as an addendum to content during pedagogical teaching. Such a view- he argues promotes the notion that computers like other traditional tools such as overhead projectors is added to the curriculum to enable curriculum developers continue implementing traditional subject based teacher--directed instructional plans where computer environment remains peripheral, an `add on` in space and time. Instead he suggests that technology is integrated when used in a seamless manner to support and extend curriculum objectives and engage students in meaningful learning.

According to Mutuma (2005) the use of ICT as part of the learning process can be subdivided into three different forms - Object, aspect or medium. As object, one refers to learning about ICT as specific courses like computer education, learners familiarize themselves with hardware and soft ware including packages such as Microsoft word, Microsoft excel and others. The aim of computer in this context is literacy. As aspect one refers to application of ICT in education, such as computer aided and manufacturing. Finally ICT is considered as a medium whenever they are used to support teaching and learning. In teaching ICT integration is considered both as an aspect and medium. The contemporary perspective according to Wekhaya (2010), Lack and Abrahams (2001) is in- cooperating ICT not as a separate entity but as a resource in pedagogical instructions. Integration therefore goes beyond computer literacy to include preparation, use, selection and operation of appropriate ICT materials in order to build knowledge as well as develop critical and creative thinking among students. Integration of ICT in the teaching and learning process is based on the principle that the linkage between content and methodology determines the learning outcome (Tony 1992). For effective integration of ICT in the teaching of Biology, teachers have to play a central role as intermediaries and use computer to fit into the curriculum and not the curriculum to fit into the computer. Integrating ICT into teaching and learning is not a new concept. Radios and Televisions have been used in the past under the banner of electronic media service to strengthen conceptual learning. Technology should be used not because it is available or it has been shown effective in some cases. It should be used to enable the process and enhance learning. ICT integration is therefore more of a process than a product as simple placement and/or software will not make integration naturally follow. (Eagle, 2002)

Integration focuses on how ICT is used and not simply whether it is used. Computers and Internet can be harnessed to improve the efficiency and effectiveness of teaching difficult topics in Biology. Application programs instructions (software) are usually used in a computer during ICT integration to accomplish tasks. When explaining nerve transmission across a synapse in Biology, animations and simulations from installed software come handy. In a properly crafted ICT Integrated lesson ICT and pedagogy are molded into one entity. As a result the quality of the lesson realizes improvement in pedagogy. According to Karseti, and Larose (as cited in Wekhaya, 2010), Pedagogical integration of ICT in education is "use that permits either enhanced learning or enhanced teaching.

ICT Integration in Teaching Around the World

Academic activities that reflect the nature of high performance work groups in the 21st Century are being rekindled globally as learning activities extend beyond the traditional boundaries of the classroom fostering cross disciplinary connections and promoting global awareness and cultural understanding.

In Canada a project entitled "Computer Support International Learning Environment" (CSILE), was according to its author, the first system to offer a learning process based on collaboration between teachers and the students. The first version of the system goes back to 1986 and consists of a common database created by students and teachers via the Internet. The sharing of information between teachers and the students made collective knowledge of the class available to everyone, encouraging collaboration between the students in order to facilitate apprenticeship. This according Luc Guay (2007) conforms to 21st Century trends where knowledge is inductive, that is non-directive and based on experiments, explorations and spontaneous constructions carried out in micro-world which is displayed on a computer screen subjected to the requirement of the programs used. Deductive methods on the other hand have teachers directing the learning process through questions most of which are pitched on recall and comprehension and seldom at comparing, inferring, reasoning and evaluation.

Effectiveness of ICT in building knowledge and understanding was demonstrated in the United States of America in 1996 when the center for applied special technology (CAST) published results of a study carried out with 500 pupils in grades 4 and 6 in seven cities in the United States. According to Luc Guay (2007) half of the pupils had followed their courses of civil education through the Internet whereas the other half had followed them in the traditional way starting from the statement of their teachers using the handbook and their printed exercise books. The study showed that the pupils who had accessed the internet for the information retrieval, for the treatment of the new information and for the communication of their synthesis (experimental group) obtained much better results than those who had used technology (control group). Additionally four American research teams worked on didactical tools using ICT. The result of their work showed enhanced understanding of concepts by students and made it possible to believe that ICT represents very useful tool in the instructional process in all subjects including Biology (ibid p.13). Kinnaman (1990) observes that in America the number of schools owning computers increased from about 25% to virtually 100% between 1981 to the end of the decade.

In Brazil ICT has extensively been used to increase access to quality education (Gutternman et.al, 2009). The country's national ICT policy makes it a requirement for institutions to integrate technology in education (Muyaka 2012). The country has adopted an education rate (e-rate) that ensures that the cost of connectivity is affordable for both institutions and citizens. It has also developed a center to train laboratory coordinators and teachers to ensure long-term success in the learning institutions) and also allow for teachers professional development (Gutternman, et.al. 2009).

Europe has developed a computerized teaching environment. The European council published in 1998 report widespread use of information technologies in improving teaching. The experiments presented in the report following a conference held in Finland set to answer questions as to whether ICT integration enhances learning. The number of students having access to ICT constitutes according to the report, a powerful motivation (Mars, 1998).

In Scotland most schools, colleges and other centers have put up effective infrastructure. In 2007 the government noted that almost all the institutions had access to broadband Internet connection (Government of Scotland 2009). Scotland ensures that integration of ICT in education starts with fundamental classes both pre-schools and primary institutions being provided with a wide range of ICT infrastructures. The country has upgraded the Internet supply moving to switch- based distribution arrangement capable of delivering data and application to the desktop at high speed. They have set aside devolved budgets for institutions to be able to procure equipment and software to meet the particular needs of the schools. All these practices of integrating ICT in supporting T/L show that a new relationship towards knowledge is progressively taking hold in the field in Europe and America.

Studies conducted by UNESCO (2007) in Asian countries indicate that ICT has the potential to help broaden access to education and improve teaching outcomes Waema (2005) considers the impact of ICT in education in India too great to be ignored crediting the sub-continent as having the largest scientific manpower in the world.

In Africa, inadequate ICT infrastructure is commonly cited as major hindering factor towards ICT integration (Urwin, 2005). Some countries in Africa like Botswana and South Africa have made great strides in the technological arena. Jegede (2001) considers Botswana as an example of an African country successfully using ICT in distant and teacher education. University of South Africa (UNISA) has modern computing systems but according to Wiechers (1996) it still needs great emphasis on technology. Glen and Isaacs (2007) notes that teachers preparation programs in Africa are biased towards development of ICT operational skills rather than integration of ICT in pedagogical practice.

Njoroge (2007) quotes Wamukote, Angodi and Onguko (2010) in their study of integration of ICT in East Africa as recommending the need for teacher professional development (TPD) in the region to shift emphasis from acquisition of these skills for improved teaching and learning experience. He further states that TPD courses are essential to facilitate the acquisition of relevant teacher competence for effective ICT integration in class. This is done through "ACADEMIA" that offers programs to practicing graduate teachers drawn from the East African countries- Kenya, Uganda and Tanzania where participants are exposed to contemporary ways of Teaching and learning which includes ICT integration in pedagogical teaching of Biology. The graduates from ACADEMIA eventually form critical mass to ultimately facilitate the improvement of education towards standards in the region and facilitate professional development of other teachers in ICT integration.

Kenya's long-term development blueprint (vision 2030) considers technology and innovation as one of the foundations in which three key pillars -Economic, social and political governance is anchored. The education sector is key to achieving the above vision. Integration of technology in the instructional process in Biology and other subjects has been undertaken to access quality information and arouse learners' interest and curiosity. ICT became an education policy priority by the Ministry (Ministry of Education, 2006; Ministry of education and technology, 2005). The ICT options were based on Sessional paper No 1 of 2005 and Kenya Education support sector program (KESSP) paper and outlined among other priorities improving quality teaching and learning, improving educational policy and coordination considering costs and benefits of educational interventions. The options that were included in the Sessional paper and KESSP were:

1. Training.
2. Quality teaching and learning through ICT with focus on e-content development.
3. ICT 's in teacher training colleges
4. Computers in secondary schools
5. Computers in primary schools cluster centers.
6. ICT for in-service teacher

The government of Kenya aims at achieving these goals by:

1. Promoting the development of an integrated e-learning curriculum to support ICT in education
2. Facilitating public- private partnership to mobilize resources in order to support e-learning initiatives.
3. Promoting the development of content to address the educational needs of primary, secondary and tertiary institutions.
4. Creating awareness of the opportunities offered by ICT as educational tool to the education center.

On computer for secondary schools, the paper recognized the challenge of poor performance in Mathematics and Science and outlined potential benefits of ICT integration in enhancing greater critical thinking skills, scientific inquiry and analytical creative and collaborative power of computers. While recognizing the importance of ICT skills and computer studies, the paper observed the insufficiency of those skills in realizing full potential of ICT in education- creativity and collaboration, thus clearly called for integration of ICT in all subjects (SMASSE INSET, 2011).

The national ICT innovation and integration center (NIIC) was established in Kenya in 2011 and pioneer trainee teachers referred to as 'champions' were trained in the use of technology and specifically on integration of technology into classroom teaching and learning. In every constituency out of 210 constituencies, one 'champion' teacher had to be trained and he/she would in turn work with teachers in other secondary schools in the constituency to improve their ICT integration skills. The strategic objective for training was to build capacity for at least one teacher in each school to teach ICT, support ICT literacy and integration and help in basic maintenance of ICT equipment. Other than the ministry' initiative of training a teacher in every constituency which has been successfully undertaken, SMASSE has been training subject trainers in mathematics, Biology, Chemistry and Physics in every District (now counties). The trainers train teachers in their subjects during holiday in-service education and training. The government went further to promote Kenya as an ICT destination within the region by establishing Kenya Information and Communication Technology Board (Kenya ICT Board). It was tasked with establishment of ICT infrastructure, encouraging competitive ICT industries in the country by developing, launching and driving a national system of innovation for Kenya. This would ensure creation of locally manufactured ICT infrastructure that support the local syllabi and content that would enhance use of ICT for teaching and learning in schools. After making it a priority to procure global Internet, in 2010 the government acquired undersea fiber links, which have provided global Internet to the country greatly reducing the delays and high costs that were associated with satellite links. The government however still identifies ICT hardware, software and connectivity as the three areas that are key pillars in providing ICT infrastructure for easier access (Kashorda, Acosta and Nyadiese, 2007). A number of collaborations with institutions like Universities and private ICT industry have been established by the Kenya government to assist in developing and assembling cheap personal computers. Other efforts by the government to encourage ICT integration include discussion with software vendors about software license cost to reduce Internet costs. Biology teachers will have to be masteries in content and pedagogical skills in order to offer quality instructions and realize improved performance in the subject.

Statement of the Problem

Constructivist approach to learning in the 21st Century requires learners to move from reproduction of information to construction of new knowledge. Consequently students must focus their activities on creativity, critical thinking, communication and collaboration to unlock the Biology potential in them. The teacher's role is increasingly being transformed from someone who imposes the memorizing of established knowledge to one who facilitates learners in their apprenticeship. Learning of Biology is expected to be concept based but quite often teaching and learning approaches used by teachers in teaching Biology tend to lean towards expository (transmission) than heuristic (discovery) methods. In the former knowledge is deductive- handed to learners while in the latter it is inductive- based on experiments, exploration and spontaneous construction. The outcome of the instructional process measured through evaluation in National KCSE Biology results has remained unsatisfactory.

National Biology results in the last five years (2009-2013) indicate that candidates underscored in all the three Biology papers—1, 2, 3 (Table 1). The marking reports from Kenya National Examination Council identified grey areas in the performances as description, explanation and "accounting for" questions. These areas according to Blooms taxonomy of instructural objectives borders on analysis, application and evaluation. Questions dealing with processes that describe working of organs are abstract and are poorly done. These sub-topic areas can be taught effectively using computer simulations and animations due to their abstract nature. Practical areas that required" accounting for" presence and absence of certain foods like reducing sugars, non-reducing sugars, proteins, starch, ascorbic acid and lipid were poorly done. These practical aspects require understanding of the concepts behind the activities, doing, observing and making conclusions and inferences. Students' performance in Biology mock examination in Mumias sub-county has been poor more so in essay, compulsory questions and practical papers. Students however score averagely in paper one which is mainly structured.

KCSE Biology results in secondary schools in Mumias sub-county follow a similar worrying trend as the national one. The average mean grade in the subject for the last five years (2009-2013) has stabilized at C-.

Table 1: National Biology Examination Results (2009-2013)

Year	Percentage score
2009	P1- 20.14 P2- 18.41 P3-15.86
2010	PI-21.39 P2-18.67 P3-18.42
2011	P1-22.74 P2-23.31 P3-18.84
2012	P1-19.77 P2-20.70 P3-11.97
2013	P1-28.03 P2-22.36 P3-12.88

Source: KNEC

The three papers test different concepts. Paper 1 (231/1) consists mainly of low order testing skills questions (LOTS) and require recall and brief explanations. Paper 2 (231/2) has more comprehension. There are also compulsory data based questions and essay type descriptive questions. Paper 3 (231/3) is a practical paper that emphasizes analysis, synthesis and evaluation. They test manipulative skills apart from recall and comprehension.

It can be seen from table 1.1 that paper 1 was comparatively well done than paper 2 while paper 3 was poorly done. The result points out to the fact that learners are not doing well in high order testing skill questions (HOTS). These questions require understanding of concepts and constructivism on the part of the candidate. This is better achieved through improved pedagogical teaching methods. Table 2 shows mean and grade summary of Biology in the Sub County for the last five years giving insight of the examination results trend.

Table 2: Mean Scores in Biology (KCSE) in Mumias Sub-County

Year	**Mean score**	**Mean grade**
2009	4.63	C-
2010	4.71	C-
2011	5.92	C
2012	4.63	C
2013	6.39	C
AVERAGE	5.25	C-

Source: DEO'S Office Mumias

The slight improvement in subject means between 2009 and 2011 could be attributed to many in-service workshops increasingly being carried out by SMASSE that includes ICT integration. The mean scores and grades are still low pointing to the need to improve pedagogy.

Purpose of Study

The purpose of this study is to explore and determine the impact of ICT integration in enhancing pedagogical teaching of Biology in Secondary schools in Mumias Sub-County. In the process of ICT integration the instructor takes cognizance of the potential of ICT tools in enhancing participatory pedagogies. In particular this study endeavors to determine how ICT integration in teaching of Biology enhances learning process.

Objectives of the Study

The objectives of the study will be to:

1. Investigate teachers' preparedness in integrating ICT in pedagogical teaching of Biology Identify: (a) ICT tools (b) methods, and (c) process of ICT integration in pedagogical teaching of Biology
2. Identify the challenges experienced by teachers in ICT integration during pedagogical teaching of Biology
3. Find out strategies employed by teachers in overcoming the challenges of Integrating ICT in pedagogical teaching of Biology

Research Questions

The research questions below were formulated by the researchers to guide the study:

1. What is the level of preparedness of Biology teachers in Secondary schools in the Sub-county in integrating ICT in the pedagogical teaching of Biology?

2. Which (a) ICT tools, (b) methods of ICT integration, (c) processes of ICT integration are-used by Biology teachers in pedagogical teaching?
3. What challenges are experienced by Biology teachers in the integration of ICT in the teaching of the subject?
4. What strategies are employed by Biology teachers in overcoming the challenges of Inco-operating ICT in pedagogical teaching of the subject?

Theoretical Framework

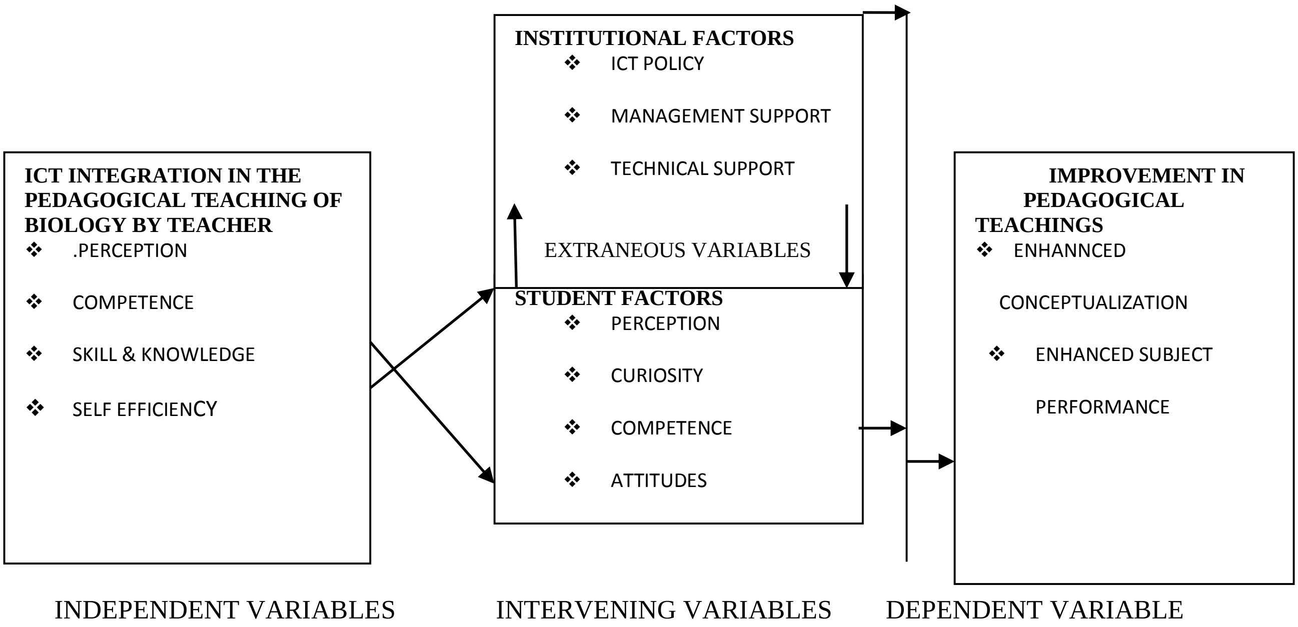
This study is modeled on system theory by Ludwig Von Bestalanffy (1928) advanced by Kate and Kahn (1966). According to this theory a system is a collection of interrelated parts, which form some whole. This theory was preferred over neo-classical organizations theory which the researcher felt cannot suffice because of their emphasis of schools as fragmented and closed social units independent of external force (Backer, 1973). System theory mentions two types of systems-closed and open systems. Closed systems are self-supporting and do not interact with the environment. Open system on the other hand interacts with the environment on which they rely on obtaining essential inputs and discharging of outputs (Kate and Kahn 1966). Cole (1993) a proponent of system theory asserts that there is a great interdependence between the system and the environment and further says that if anything goes wrong in the environment or any of the sub systems the other systems will be affected and this will affect the output.

Schools are managed more like systems where educational programs are innovated and re-innovated to realize the importance each part makes to the whole, and the necessity of eliminating the parts that make negative contributions. Biological Science Department can be considered as a sub-system within the school. The school has other systems like administration that may support ICT integration by purchasing computers and laying infrastructure, finance and procurement, discipline, guidance and counseling and many others. Improvement in the pedagogical teaching and resultant good performance in Biology is part of the output measured through formative and summative evaluations respectively. The output is therefore affected not only by what goes on in the Biological science classroom like instructional methods but also in other departments like finance, procurement and discipline that is concerned with availing and effective use of the resources. Due to these interactions, schools are better studied as a whole rather than parts. System theory postulates that schools are like open systems which of necessity engage in various modes of exchanges with the environment (Katz and Khan, 1966). The environment includes the community in which the schools are located and from which the learners and teachers are drawn. This entails the social, cultural, physical, climatic, economic and even political aspects such as Educational policies.

Conceptual Framework

There are variables that interact to influence the quality of pedagogical instructions the learner receives. These are independent and dependent variables. In this study, it is implied that incorporation of technology in the teachers' pedagogical teaching methods are the independent variables which influence outcomes that is quality of instruction which is improvement in pedagogical teaching. This qualitative aspect can be observed by the interest and participation that learners show during lessons that should naturally lead to improved performance. Improvement in pedagogical teaching is the dependent variable as it depends on the independent variable (ICT integration in pedagogical teaching). There are extraneous variables that affect the outcome of teaching. These are institutional factors like ICT policy of the schools, support structures and technical support. If these are positive then improvement in pedagogical teaching and resultant good performance by students will be realized. There are special extraneous variables called intervening variables, which are related to the independent variables that can shift the outcome (pedagogical teaching) to the positive or negative. These variables include perception, curiosity, interest, competence and attitude of learners and determine the direction of outcome. These students' factors are what the researcher describes as intervening variables. Improvement of pedagogical teaching of difficult topics in classroom can be realized by applying proper pedagogical practices

Figure 1: How ICT Integration Affects Learning Process



Source: Researcher

In the conceptual framework depicted in Fig 1, ICT integration is hypothesized to influence pedagogical teaching of difficult topics in Biology. The framework postulates that the status of ICT integration (independent variable) in pedagogical teaching of Biology affects the quality of teaching realized by improvement of pedagogical teaching (dependent variable). However this relationship may be modified due to students' factors like perception, curiosity, interest, competence and attitude (intervening variables). These intervening factors are caused by independent variables (ICT integration in pedagogical teaching of difficult topics in Biology) and affects dependent variable (improvement in pedagogical teaching of difficult topics). Extraneous variables like ICT policy, management support and technical support although not caused by independent variable affect the dependent variables.

Research Design

This study was conducted through descriptive study using survey design. Descriptive studies describe the state of affairs as they exist (Kerlinger, 1973). Survey designs provide numeric descriptions of some part of the population- representative sample from which a pointer to the population trend is established (Bell, 1993). Descriptive survey design enabled the researcher to obtain information on the state of ICT integration in the pedagogical teaching of Biology in secondary schools in Mumias Sub county by accessing opinions of students, teachers, head of Biological Science departments and Principals of the schools to asses the effects such integration has on pedagogical teaching of the topics (Best & Kahn, 1992). The approach to the study was both quantitative and qualitative.

Target Population

The target population consisted of all 49 secondary schools in Mumias Sub-county having 14934 students, 497 teachers and 49 head teachers. Out of these, 45 are public schools and 4 are private schools. County, some private and sub-County secondary schools in the sub county are endowed with ICT resource tools for pedagogical teaching. The researcher therefore felt that selecting 4 County schools and one private school would provide a reliable picture of ICT integration in schools in the sub-county.

Sampling Techniques

The researcher selected 5 schools from a sampling frame of 49 schools selected through stratified sampling. This being a finite universe the researcher employed a sampling technique that could minimize bias in sample selection while at the same time being representative of the population. Two forms of probability sampling- stratified random sampling and simple random sampling were used to put schools into three categories- County schools, Sub-county schools and private schools. Four County schools and one private school were selected through random sampling. Teachers and student respondents were purposively or randomly selected in the schools while the Head teacher of the schools were selected for interview.

Sample of students. After selecting the 5 secondary schools, a stream in forms 1,2,3 and 4 was randomly selected for the purpose of administering student questionnaire. Ten percent of students (5) in a chosen stream of a class were sampled for study. Where there was single sex systematic sampling was applied. Admission numbers were used where students were present in schools. Admission register was used to obtain student admission numbers. Where both boys and girls were present the researcher strove to strike gender balance by employing stratified sampling method to separate boys and girls and thereafter get 10% of either sex through systematic random sampling. A total of 100 students from the schools were selected for study.

Sample of teachers. A biology teacher in every school teaching a cross section of biology classes was selected through random sampling unless he/she was the only biology teacher. The most experienced teacher was purposively sampled where there was more than one Biology teacher.

Sample of Head teachers. One Head teacher from each of the five chosen schools was subjected to an interview by the researcher. Head teachers from the three pilot schools were also interviewed. The researcher interviewed all of the eight Head teachers.

Determination of Sample Size

A sample is part of the target (or accessible) population that has been procedurally selected to represent it. It is any number of cases less than the total number of cases from which it is drawn (Ingule & Gatumu, 1996). The sample consisted of 5 secondary schools selected from 49 secondary schools in the sub-county. This represents 10% of the total number of secondary schools in the district. The sample size of students will be 10%of the number of chosen students in a class. The Head teachers of each of the sampled schools will be interviewed.

Table 3: Sample Grid for all Item Categories

Item	Population
Number of Sec schools in Mumias sub-county	49
Selected schools	5
Pilot schools	2
Head teachers selected	5
Biology teachers sampled	5
HoD'S Biology	5
Total number of students in sub- county	14697
Sampled Biology students in 5 schools	2972

The total number of students in sampled schools (2972) represents 20% of the total number of students (14,697) in the Sub-County. This according to Cohen and Manion (1994) is representative and acceptable in survey as it represents acceptable percentage range (20-30%) of the target population under study.

Construction of Research Instruments

The researcher used Questionnaires and interview schedule as the main instruments for data collection. The researcher was mainly concerned with views, opinions, perceptions, feelings and attitudes. Such information can best be collected through the use of questionnaires and interview schedules (Bell, 1993; Touliatos & Compton, 1988). Questionnaires for teacher, Students and Heads of department were semi-structured. This enabled the researcher to balance between the quantity and quality of data collected and on the other hand provides more information useful for a fuller explanation of the phenomena under investigation. Observation schedule was deployed to observe live lesson taught using ICT integration and students' responses.

Questionnaires

The researcher employed questionnaires for students, teachers and Heads of Biology departments. The semi-structured questionnaires gave respondents greater chance of expressing their views, ideas, opinions and suggestions on ICT integration. Quantitative and qualitative data was collected through the questionnaires developed by the researcher and modified by experienced teachers after undergoing Pilot study. Data from teachers questionnaires was used to cross cheek and supplement information provided by students on ICT integration. The questionnaires were administered by the researcher and research assistant working under researchers' instructions. The heads of departments' supplemented information given by teachers and provided overall picture of ICT integration in all classes taught by various teachers. Student questionnaires had three sections-A, B and C. Section A dwelt on personal information, section B on preparedness of students in learning through ICT integration while section C was on ICT tools, integration process, challenges in the use of ICT integration in T/L and possible solution to the challenges. Teachers and HoD's questionnaire followed the same format but 'learning' had been replaced by 'teaching.'

Interview schedules. Interview schedules-for Head teacher was used to collect information pertaining to the use of ICT in the schools in terms of availability, usage, challenges in usage, improvement in ICT infrastructure and training. Bode and Henry (1983) state that interviewing is an appropriate instrument for any study as it helps the interviewer to cover all the dimensions of the investigations through probing of the respondents

Observation schedule. Lesson observation schedule was used by the researcher to confirm ICT integration in classroom. Two schools were selected for observation. Observation schedule was used to verify ICT resources/tools used, their relevance to the chosen sub- topic taught, integration process in terms of synchronization of resource and content blending in the pedagogical teach

Confirmation of availability of ICT tools for integration is important since you cannot use what is not there. The working condition of computers and various software and hardware affect pedagogical teaching of Biology. The researcher gained firsthand experience without informants' on the state of ICT in schools. Observation helped bridge the gap between what people say they do and what they actually do based on what is there and used. The researcher sought to observe ICT tools, infrastructure, storage, usability and their state.

Pilot Study

The researcher conducted a pilot study before commencing the main research. The purpose of the pilot study was to pretest the instruments on a small sample of respondents before commencing the actual research work. Pilot studies helped Identify and rectify mistakes prior to use in actual research work. Piloting was done in two schools- one County and private school. Two Head teachers, two teachers and 40 students were used to pre-test interview schedule, teachers and students questionnaires. Observation schedule similarly tested and improved in the chosen school. The researcher used the findings from the pilot study to validate.

Table 4: Schools Chosen for Pilot Study

Name of school	Type	Category	Division
Mumias Girls Muslim	County	Girls Boarding	Mumias
Rehema Academy	Private	Mixed Day	Mumias Central

Source: Researcher (2015)

In the above schools selected for pilot study a quarter (10 %) of student in the class or stream was chosen by random sampling and systematically administered by questionnaire. For single streamed school form one to four classes were administered with questionnaire while Biology teacher/s were purposively or randomly sampled for pilot study

Validity of Instrument

A valid instrument accurately measures what it is supposed to measure (Bennars & Otiende, 1994). According to Mugenda and Mugenda (2003), an instrument that yields valid data will necessarily yield valid information. The validity of the instrument was determined by using long serving teachers in the district to judge how well the measuring instruments met standards through content (content validity). The instruments appearance – showing genuine features was checked to ensure originality (face validity). Comparison of the outcome of the prevailing conditions with the predicted outcome was made and correction made (criterion related validity). Experienced teachers in the county ascertained construct validity during construction of instrument by presenting it for review during piloting. The researcher also ensured that the scores from instrument accurately predicted a criterion measure by making amendments (predictive validity). Finally the results obtained using instrument was checked if they correctly correlate with other results (concurrent validity) and amendments made to make it valid. To establish validity, the instrument was given to two experts to evaluate the relevance of each item in the instrument to the objectives and rate each item on the scale of very relevant (4), quite relevant (3), somewhat relevant (2) and not relevant (1) Validity was determined using content validity index (CVI) .CVI = items rated 3 or 4 by both judges divided by the total numbers of items in the questionnaire. This is symbolized by n3/4/N. A coefficient of 0.80 or more will imply that the instrument is highly valid.

Reliability of Instrument

Reliability can be defined as the degree of consistency between the measures of the same kind. Kothari (2005) defines reliable instrument as that instrument that provides consistent results. The researcher ensured that responses from respondents are consistent across variables through testing and retesting the questionnaires. Students of the same class level and streams were used to ensure that the individuals do not vary their responses if the instruments were to be administered a second time (stability). Colleagues were encouraged to administer a copy of the same questionnaires to students and rectifications were made to ensure that errors made during administration or scoring of instruments is eliminated. The colleagues' scores were compared with the result obtained by using researcher's questionnaire (equivalent aspect) to enable rectification to be made. The instruments was piloted in the schools which were not be included in the study sample and modified to improve their reliability coefficients to at least 0.70. According to Kathuri & Pals, (1993) coefficients of at least 0.70 are acceptable as valid and reliable in research. Reliability involves formulating the main instrument - student and teachers questionnaires by splitting them into two halves, odd and even with items sampled from the main domain of indicators measuring variables Respondents score in one part will be correlated with scores from the second part using the formula:

$$Rx = \frac{\sigma r^2}{\sigma^2 x} \quad \text{- Reliability coefficient}$$

Data Collection Technique

The researcher sought permission to conduct research from Head teachers of Schools and later used the privilege to interview the Principals and administer questionnaire to teachers, HODs and Students. The data was collected using questionnaires and Interview schedule. The researcher visited the schools under study before the start of research to familiarize with respondents and request for their cooperation made.

Data Analysis Procedures

Analysis is the computation of certain indices or measures along with searching for patterns of relationship that exists among the data group (Kothari, 2005). Since open-ended items were included in the semi structured questionnaire qualitative or non-empirical data generated required qualitative and quantitative techniques of data analysis.

Data Analysis from Questionnaires

Raw data obtained from the field using questionnaires for teachers and students were organized and edited for errors and omissions. Data were separated into consistent component parts or elements separately and in relation to the whole. Data were then coded by assigning numerals and other symbols so that responses can be put into limited categories. It was important because the data was mainly descriptive hence requiring translation from qualitative to quantitative forms. After coding data was classified by arranging them into groups or classes to reduce the large volume and put them into homogenous groups to get meaningful relationship. They were then be analyzed by aid of statistical package for social science (SPSS) using descriptive statistics. Frequencies and percentages were mainly be used. Tabulation of the results was done by arranging same kind of data in a concise and logical manner to help answer research questions.

Interview schedule. Data collected through interview with school Head teachers and QASO was qualitative. A personal interview in the form of personal investigation was carried out in a structured manner. Raw data from interview records underwent coding and classification.

Classroom observation schedule. Data that was obtained from observation using classroom observation schedule took into account teachers and students activity. Two different schedules; one used in a class where ICT integration was employed in pedagogical teaching of Biology and the other one where conventional teaching method is employed without ICT use was employed. The researcher observed the learning process in both teacher and learner.

Logistical and Ethical Considerations

These are considerations that may hinder the researcher obtaining accurate information (Mugenda and Mugenda, 2003). Logistics refers to all those processes, activities or actions that the researcher must address or carry out to ensure successful completion of research work. The major ethical problem in this study is the privacy and confidentiality of the respondents. Obtaining valid sample entailed gaining access to specific lists and files which itself is an infringement on the privacy and confidentiality of respondents. Without this, construction of sample frame and generation of representative samples would be difficult. The solution to this problem is the respondents ignoring items they do not wish to respond to. Apart from the fieldwork logistics, there is pre-field and post-fieldwork logistics. Pre-field work logistics included establishing work plan, obtaining permit and construction and pre-testing instruments. These are done with a lot of humility and courtesy. In post-fieldwork logistics, analysis requires honesty and sacrifice. Cohen and Manion (1994) state that the researcher should take appropriate precaution to protect confidentiality of both respondent and data.

Summary

This discussion was designed to generate data on improvement of pedagogical teaching of topics in Biology through ICT integration. The research was designed to generate both quantitative and qualitative data. The instruments used for this purpose - namely, questionnaires, interview schedule, classroom observations schedule. The target population was 49 secondary schools in Mumias sub-county. A drawn sample of 5 schools representing 10 % of the target population was used. All classes – form one to four were involved in the study with purposive sampling used to select a stream in each class. Teachers were purposively and randomly sampled depending on whether they were teaching the classes with experienced colleagues or not. The Head teachers of all the 13 schools together with HOD's of Biological science were selected for study. Interview schedule helped confirm the findings from teachers and HOD's. The choice of a small target population, right tools and minimization of extraneous variables through random sampling, it is believed helped result into successful research finding.

Research Findings and Discussion

Objective one: *Teacher preparedness for ICT Integration in the teaching of Biology*. Research investigation into preparedness of Biology teachers in integrating technology into their teaching revealed that teachers are ICT literate having attained Certificate or Diploma in Computer training. Their students were equally computer literate with students in town schools showing high rate of literacy than students in rural schools (Table 5)

Table 5: ICT Literacy Level in Teachers and Students

Respondents	Number (N)	ICT Literate	ICT Illiterate	Percentage Literacy
Biology teachers	5	5	0	100
Students	100	71	29	71

It was however revealed that Schools in the urban area (Mumias Central) had 83% student literacy level compared to schools in the rural setting (27%). Teachers showed high rate of literacy and academic qualification. Such qualification and literacy is expected to naturally translate into high levels of ICT Integration in pedagogical teaching of Biology.

Table 6: Qualifications of Teachers

Respondents	Number (N)	Academic Qualifications Certificate:Diploma:Degree			ICT QUALIFICATIONS Certificate:Diploma:Degree		
Biology Teachers	5	-------	1	4	4	1	-----
Headof Departments	5	-------	------	5	3	-----	------
Total	10	-----	1	9	7	1	-----

In addition to their academic and computer literacy, most of the teachers attend workshops on ICT integration once a year. Despite these advantages majority of Biology teachers do not integrate technology in their teachings as can be observed from the findings in the table below.

Table 7: Do Biology Teachers Integrate ICT in their Teaching

Respondents	**Number (N)**	**YES Weekly:**	**Termly:**	**Yearly**	**Not at all**
Students	100	49	12	4	35
Teachers	5	1	---	1	2
HOD	5	3	--	--	2
Principals	5	2	2		1

Table 5 shows that the level of ICT integration remains low even with high level of literacy in both teachers and students. Most teachers are youthful and within the age group of 25-34 (80%) according to the research finding. They are expected to spearhead ICT integration but that is not the case. The table also shows that HODs and Principals believe teachers are frequently integrating ICT in their lessons weekly but both teachers and learners say they rarely do. Human factors affecting adoption of technology in teaching are attitudes, perception, competences and self-efficacy. Human factors may be barriers to both preparation of teacher and even ICT implementation. Galanouli and McNair (2001) indicate that individual teacher's attitude is crucial in determining whether the teacher will integrate ICT. Other human factors like lack of confidence in using ICT, resistance to change, negative attitude towards ICT and lack of perceived benefits are among consistent barriers to teacher integration of ICTs (Becta 2004). Edooley (2000) as cited by Gakuu (2006) states that the way people perceive and react to technology is far more important than technological obstacles in influencing ICT implementation and use

Objective 2: ICT tools, methods and process of integration. Secondary Schools in Mumias sub-county are endowed with ICT resources that can make a difference in Biology performance if properly utilized. The table below gives the schools ICT position.

Table 8: Respondents View on ICT Tools Available in the Schools

ICT TOOL	**STUDENTS**	**TEACHERS**	**HODs**
Computer	78	5	4
Radio	1	2	2
Mobile phones	2	1	1
Digital Camera	5	2	1
Television	4	2	2
Internet	-	4	2
Interactive white board	21	2	2

Computers were the main ICT tools found in the secondary schools under study according to students (78%), teachers (100%) and HODs (80%). Interactive white board is making a strong entry into an otherwise blackboard/Black wall dominated classroom. Mobile phones are universally owned by citizens but since they are prohibited in schools students did not mention them as an available ICT tool. Digital Cameras are now readily available in every school. Televisions are still a source of learning especially on Ecology. Connections can also be made to the screen via external devices. Radio lessons that used to be aired through electronic media service are no longer dependable. When asked how useful computers are in ICT integration respondents gave the responses captured in table 9 below:

Table 9: Importance of Computer in Teaching and Learning

Respondence	**Stimulate interest**	**Arouse curiosity**	**Enhance syllabus coverage**	**Enhance Understanding Of concepts**	**Access Quality information**	**Communicate With remote groups**	**Receive Feedback Outside classroom**	**Help participate in democratic process**
Students	21	9	3	49	42	4	3	-
Teachers	3	1	2	3	3	2	-	-
HODs	1	1	-	3	-	-	-	-

Teachers need support to ensure ICT integration takes root in teaching of Biology. In two schools sampled teacher respondents (40%) felt the schools were giving necessary support by loading Internet to enhance students and teachers' research work and also servicing computers regularly. Majority of teachers (60%) however felt there was no enough support by the institutions to support ICT integration. The institutional factors like management and technical support play an important role in general preparedness of a Biology teacher to embrace and integrate ICT in the teaching of Biology. William- Green et al (1997) contends that culture developed within an institution or within an organization can act as a barrier to change. In order for new technology to be placed in an organizational culture, there must be a match of organization and Technology (Hodas 1993). Kara (2008) suggests that management of ICT should involve two levels: Strategic level which involves reviewing and putting in place the most appropriate way of exploiting ICT, sourcing and using new ICT as needed by the organization and- Operational level which involves providing high quality, reliable, capacity building, delivery implementation and application as well as monitoring usage and effectiveness.

Objective 2b: Methods of ICT integration. Methods of ICT integration involve Topic (meso) level and Lesson (micro) level. CDs and DVDs containing topics and sub-topics are run. The researcher who was watching a lesson on blood flow through the heart observed the animations and simulations. The topic was Transport in animals (meso) while the lesson was 'Pumping mechanism of the heart' (micro). Table 2.5 shows that students use computer during learning process where it is integrated in the lesson to demystify difficult topics (49%) and also to access information through the net (42%). It may also happen at Curriculum (macro) level when students watch wildlife film. This is a case of cross-curricular integration method.

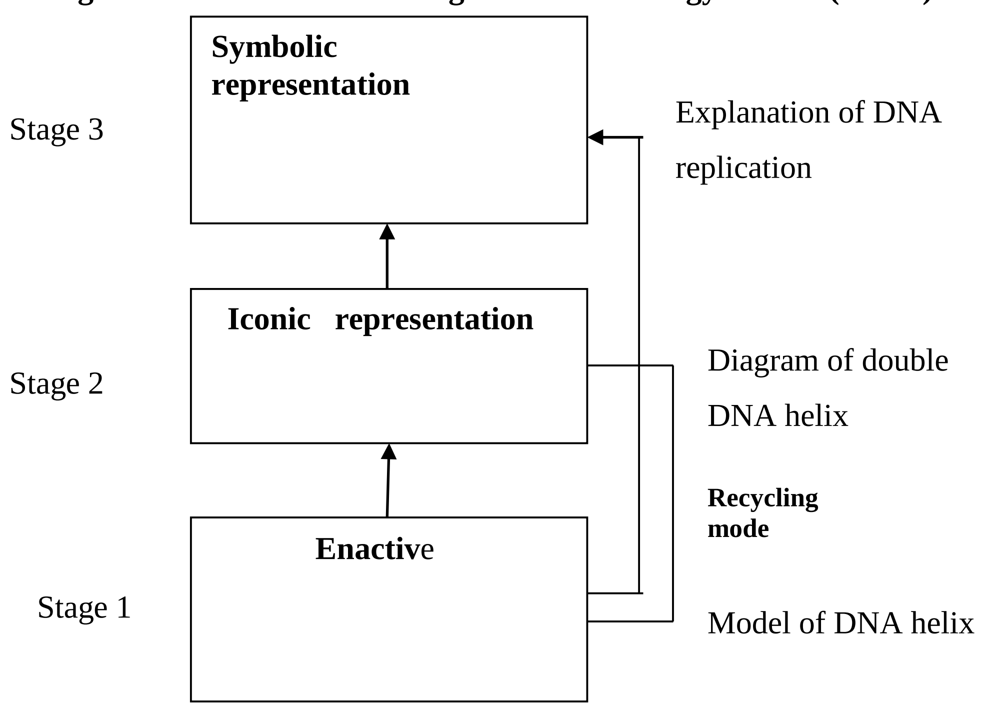
Objective 2c: Process of ICT integration. The process of integration is **enactive/manipulative**, **iconic** and **symbolic** representation. These steps or stages constitute the process of ICT integration in a lesson. According to Jesome Brunner (htt:tip.psychology.org/brunes.html) there are three critical stages in ICT integration process that are necessary for effective teaching and learning and teachers need the skills to make a seamless combination and integration of the three stages. These stages are: **(a) Enactive/manipulative:** In this stage students need to do or experience something like solid, gas, liquid. Students' personal interest develops through concretization of the realia. Generalizations of the characteristics are given. Exhibits and contrived experience take precedence. **(b) Iconic representation**: Richer representations of what is being taught are needed. Diagrams, photographs and other visuals that aid learning are used to enhance understanding of difficult concepts. This stage involves adding complexity to the lesson to connect between concrete (a) and abstract (c). **(c) Symbolic representation:** Clear explanations are needed from the teacher about abstract concepts. Questions can be asked by the teacher to test understanding of the concepts. This step is interactive and recycling mode is frequently used to revisit concrete stage or enactive stage. ICT can never replace the enactive step. It is always important for a student to have a real hand on experience. The student will gain understanding through experience. In most lessons iconic stage is either left out or is not well represented and that is where ICT can come in handy to fill the gap. The table below from research findings shows that students are not using manipulative skills to access knowledge as expected.

Table 10: Exposure to Computer

No of students (N)	Taking computer As a subject	Not taking computer As a subject	Exposed to computer	Not exposed At all
100	69	31	54	36

Table 10 shows that out of 69 students taking computer only 54 feel they are being exposed to computer as expected. All 39 students not taking computer together with five taking computer studies feel they are not exposed enough to it. The figure below represents the integration process of a pedagogical taught lesson in Biology- DNA replication.

Figure 2: Process of ICT Integration in a Biology Lesson (Micro)



Stage 1 is preceded by what is called Ice breaking in pedagogical term that is, a teacher applies pedagogical principles of bridging hence connecting the previous lesson with the present. In the case of DNA Replication, the teacher would revisit components of DNA like 5 carbon sugar, Nitrogen bases, and phosphate and understand base-sugar sequence and genes represented by a nucleotide. In stage 1 student would physically identify the sugars, Nitrogen bases, phosphate molecules and observe representation for bonds within Nitrogen bases.

A teacher uses a drawn chart, diagram or picture to give a two dimensional representation of DNA double helix in a drawing or picture in stage 2.Stage 3 introduces abstractions. Since replication of DNA is an abstract concept. Animation or simulations can be used to integrate pedagogical teaching with ICT to improve pedagogical teaching of these abstract concepts. Orlich (2001) states that students learn better where instructional activities are sequenced that is knowledge is presented in a carefully interrelated steps generally starting from simple step, add complexity and lastly introduce abstractions. ICT integration helps in understanding difficult abstract concepts in this hierarchy of learning.

Objective 3: Challenges faced by teachers in ICT integration. Teachers face many challenges in ICT integration in the classroom. These may be human, institutional or personal.

Table 11: Challenges Facing ICT Integration in Schools

Respondents	**Cost of computer**	**Absence of power**	**Frequent power failures**	**Cost of Dvds**	**Cost of Antivirus**	**Unavailability Of tech services**	**Cost of Accessories**	**Lack of Qualified teachers**
Teachers	---	---	3	1	1	3	2	4
%	-	-	60	20	20	60	40	80
Students		20	39	--	--	30	--	24
%		20	39	--	--	30	--	24
HOD			3	2			1	
%			60	40			20	

Several factors, mainly socio-economic tend to impede ICT integration in the teaching of various subjects including Biology in schools. Such factors render ICT integration ineffective or even impossible. These factors include infrastructure, ICT support system, costs and usage.

Infrastructure

In Africa, inadequate ICT infrastructure is commonly cited as a major hindering factor toward ICT integration (Urwin, 2005). The transmission channels, media and communication must be able to support information relay. Various parts of Kenya are not connected to the Internet or if connected there maybe some outage on connectivity which makes it difficult to connect to online content. To ease the problem of connectivity teachers ought to back up a copy of the content on a computer or any other storage media so that it can be used where there is a problem with the Internet. A teacher is also forced to print hard copy of content when Internet is not available.

Cost Factor

Computers and technological infrastructure are expensive. Furthermore user licenses for various devices that support ICT integration must be purchased together with complimentary software. Provision of computers in a classroom does not mean they are going to be used in a pedagogical way (if used at all). Since computers and technological infrastructure are costly, it needs to go hand in hand with enhancement of quality teaching otherwise the quote from Conor Bolton becomes a reality.

Poor teaching + expensive technology = Expensive poor teaching

Usage as a factor. Improper use or lacks of it by teachers due to human factors pose a big challenge to ICT integration in the pedagogical teaching of Biology. Teacher's poor perception (Gakuu, 2006), lack of preparation (Zhiling & Hambing, 2001), low self efficiency (Bandura, 1986), un-established cultural factors (Martinez, 1999) together with lack of interest (Newton 2003), poor adaptability (Becta 2004) and poor attitude (Galanouli and MeNaair 2001) are a challenge to ICT integration. The transition from a sequential learning process where everything was foreseen, to a learning process where learners have to resolve problems does not happen without clashes. In all these endeavors to embrace technology under behavioral paradigm, attitudes are not easy to modify. Newton (2003) observed that while innovators and early adopters embraced ICT enthusiastically majority faculty members seem still disengaged and uninterested in learning. In addition some digital contests are designed in some complex manner that navigation to various sections of the same content is difficult. According to ministry of Education handbook (2012) a complex digital content has been a source of frustration to most teachers in ICT integration.

Teachers who have embraced technology must not just use technology for technology's sake but must determine when it is necessary to use it otherwise they will be guilty of its improper use. Wellington (2000) aptly argues that teachers need to be able to judge when the use of ICT is effective and beneficial and when its use is ineffective or inappropriate. When successfully used in a proper context its benefit is intangible. Consider Wardsworth's quote:

> When I hear and I forget
> When I see and I remember and
> When I do and I understand (Wadsworth, 1978:161)

ICT support structures. Institutional and technical support is vital for implementation of ICT integration programs in schools. Many schools in Kenya lack computers and ICT infrastructure (Murithi 2005). Where a few computers exist the emphasis is on computer literacy and not ICT integration. According to the 1997 report by National Council for Accreditation of Teachers Education (NCATE) lack of technical support is one of the barriers that results in computers being under utilized in classes. Lai and Pratt (2006) concur and say that one needs ICT related support in the use or introduction of ICT into curriculum and teaching methods. Furthermore power blackouts are common phenomenon in most parts of Kenya. Whenever it happens electronic gadgets cannot be used thus interrupting either preparation or ICT integration. This is because many schools have not invested in alternative sources of power such as solar and diesel generators to mitigate the effect of un-reliable power. Some gadgets become defective after power fluctuations rendering them unusable. Technicians are hard to come by in case of minor malfunctions.

Other social factors. ICT integration is a new phenomenon and has not been part of the Kenyan Instructional culture. This 21st century innovation instructional method is now being Inco-operated in the education system. Martinez (1999) argues that one of the major challenge facing developing countries is how to make technology an essential part of the culture of the people. Harpes (1987) contends that cultural factors play an important role in creating a negative perception towards computers.

Objective 4: Overcoming challenges of ICT integration. Students and teachers mentioned various challenges that face ICT integration ranging from power interruptions to purchase of ICT tools

Table 4: Overcoming ICT Challenges

Respondents	**Talk to KPL to stop power interruptions**	**Buying generator/alternative power source**	**Recruiting ICT Teacher**	**Making computer compulsory**	**Recruit technician**	**Buy computer accessories**
Students	13	27	31	4	9	14
%	13	27	31	4	9	14
Teachers	----	2	1	1	--	1
%	--	40	20	20	--	20
HOD	-	-	1	--	--	4
%	-	--	20	---	-	80

The major remedy to the serious problem of power interruption is getting alternative power source. This problem of inconsistent power supply is even greater than that of lack of power. This means that the problem of connectivity is slowly being a thing of the past. Other major problems are lack of qualified teachers and technicians and costs of ICT tools

The Kenya government through Session paper number 1 of 2005 and Kenya Education Support Sector Program (KESSP) paper outlined among other measures- facilitation of public private partnership to mobilize resource to revamp ICT infrastructure to support e-learning initiative. The government also offered to create cluster centers in primary school where some computers will be based for training teachers. Some chosen secondary schools were likewise staffed with computers for training to reduce costs involved in computer-assisted learning. To improve use of ICT, training of science teachers through CEMASTEA and SMASSE- INSET in the counties is continuously being undertaken. Apart from county training, pioneer trainers (champions) have been undergoing training so as to train other teachers in an effort to improve their ICT skills. Steketee (2005) informs of preparation of teachers for ICT integration around the world as being approached in four ways;

1. ICT skill development approaches which according to Gill and Dalgarno (2008) comprises the addition of one or more ICT subjects within the preparatory course.
2. ICT pedagogy approach whose objective is to show course participants how ICT can be integrated as teaching and learning tool across the curriculum.
3. Subject specific approach that focuses on knowledge learning technologies that offer affordance to particular content area best explained by Mishra and Kohles (2006) as technological content knowledge.
4. Practice driven approach that includes preparing teachers to design and develop implementable ICT facilitated classroom programs and products. Concerning support structures the Kenya government through Economic stimulus program is striving to develop ICT infrastructure and through national ICT innovation and integration centre push for development and availability of computers.

Conclusion

Majority of teachers are ICT literate but require changing their attitude against computer use. Integration of computers in T/L can become universal if all stakeholders play their role and teachers are motivated to use them. The gains in using ICT are unprecedented. Performances in Biology and other subjects are likely to go up if integration of ICT is perfected.

Recommendations

1. Teachers should be allocated fewer teaching loads to enable them plan and execute ICT integration.
2. More teachers must be recruited to ease their loads and give them more time to incorporate technology into their teaching
3. More computers must be purchased to reduce Learner-Computer ratio
4. More technicians and teachers of computer must be recruited to fill in the technology gap
5. Computer rooms and other facilities must be put in place.
6. Teachers attitudes must changed through INSETS so that they can love to embrace ICT

References

Amutabi.(2004). *Challenges facing use of ICT in Kenyan Universities*. UNESCO forum Colloqium on research and higher Education policy, 1-3 Dec 2003.

Aryl,D.,Jacobs,L.& Razavieh,A.(1972). *Introduction to research in education*. New York: Winston.

Bandura,A.(1986). *Social foundation of thought and action. A social cognitive theory*. New Jersey. Prentice-Hall. Englewood cliffs.

Becta.(2004). *A review of the research literature on barriers to the uptake of ICT by teachers.* Retrieved August 8, 2008 from http.//www becta.org.United Kingdom.

Bell,J.(1993). *Doing your research project*. Burkingham: Open University Press.

Bennars,G.A.,Otiende,J.E.& R.(1994*). Theory and practice of Education*. East African publishers.

Best,J.& Khan,J.(1992).*Research in Education*. New York: Prentice Hall Inc.

Boaduo,NAP.(1988). *The state-church conflict in the management of Lesotho* Sussex. United Kingdom

Borko,H.(2004*). Professional development and teacher learning: Mapping the terrain. Educational Research*.33(8), 3-15.

Borg,W.D.,& Gall,D.W.(1993).*Educational research. An introduction* (4th ed) London. Longman.

Bransford, J. Brown & Cocking.(2002*). How people learn, brain, mind, experience and School (2nd edition)* Washington DC. National academy press.

Brurton,C.(2002*). New directions of ICT-Use in Education. Available online* http://www. Unesco.org/education/educprog/lwf/di/edict.pdf:accessed 7 August 2002.

CAST.(1996*). Centre for special Applied Technology. Report written under the direction of Follansbeesari. The role of online communications in schools. National study* Peabody (MA), 1996.

CEMASTEA.(2011). *National INSET handbook*. Nairobi.

Cohen,L.& Manion ,1.(1994).*Research methods in Education*: London :Rutledge.

Collis,B,& Jung,I.S(2003).*Uses of information and communication technology in education. In B.cox,M,webb,M,Abott C.,Blakely,B,Beauchamph,T.,& Rhodes,V. ICT and pedagogy. A review of the research literature*. London. Becta.

Collis,B &Moonea,J. (2001). *Flexible learning in a digital world. Experiences and Expectations*. London Kogan page Ltd.

Cumming,J & Owen,C.(2000),*Reforming schools through innovative Teaching, Australian College of Education* ,Deakin ,ACT.

Crosswell, J.W. (2007). *Qualitative inquiry and resource design: choosing among five approaches. Thousand oaks,* California: Sage publication Ltd.

CSILE.(2007). *Computer supported International learning environment. Software-tool designed by Carl Bereiter,Marlene, Scardamalia et al. Centre for applied cognitive science* Toronto 1986-1988.

Darling-Hammond,L.,(2006). *Constructing 21st century Teacher education: Journal of teacher education,57:300.* Retrieval from http://,re.sage pub.com at Aga Khan University on February 25,2008.

Ferry (2004*). Online classroom simmulation: The next wave for preservice teacher education? In Atkinson, R.,Mc Beath,C., Jonas –Dwyes,D &Philips, R.(Eds),Beyond the comfort zone:* Proceedings of 21st ASCILITE conference, Perth.(294-3.

Fullan, M.(2007). *The new meaning of educational change (4th edition*) New York: Teachers College Press.

Gakuu,C.M.(2006).*University lecturers readiness to adopt e-learning as instructional delivery tool* University of Nairobi.

Galanouli,,D.,R McNair,V.(2001).*Student perceptions of ICT –related support in teaching placements*. Journal of Computer assisted learning,17,396-408.

Gill,L.,& Dalgarno,B.(2008*). Influences on pre-service teachers preparedness to use ICTs in the classroom. In Hello! Where are you in the landscape of educational technology*? Proceeding sascilite 27, 2009. from:http://www.ascilite.org.an/conferences/me/biurne 08/procs/gill.pdf.

Glen,F. & Isaacs,S.(2007). *Survey of ICT and education in Africa: A summary report based on 53 country surveys* .Washington DC:info Dev/World Bank. Retrieved March 24,2010 from:http://www.infodes.org/en/publications 353.html.

Groove ,J.W.(2005). *Research on teacher preparation and professional development. While house Conference on preparing tomorrow's teacher* New York.

Guay, L.(2007). *History and computing. Transformation of teaching methods by ICT. Ann Arbor, Nairobi. East African MI:M Publishing*. University of Michigan library.

Gutterman.B.Rahman.S.,Superlano.J.Laura.J & Mai.Y.2009).*Global alliance for ICT and Development*. New York.

Hoffman,J.&Pearson,P.D. (2000).*Reading teacher in the next millennium. What your grandmother's teacher didn't know that your granddaughter's teacher should*. International Reading Association.35(1),28-44.

Ingule,F.& Gatumu,if.(1996).*Essentials of educational research.* Educational Publishers.

Kara A.M(2008). *Use of ICT in enhancing teaching and learning in public primary teacher training colleges.*

Kathuri, N. J.(1986*). Some factors which influence the performance of pupils in KCPE. Institute of Development including University of Nairobi.*

Kerlinger ,F.N(1973).*Foundation of Behavioural Research* New York: Holt, Renehart and Winston.

KESSP (2005*). Kenya Education Sector Support Programme 2005-2010* (KESSP) Nairobi. Government Printer.

Kothari,C.R. (2005). *Research methodology.* New Delhi. New age International publishers Ltd.

Kozma,R.(2005). *ICT, Education Reform and Economic Growth*,Intel, 2005.

Kyego, B.N.(2006*). Analysis of perception & students towards integration and use of ICT in education at technical training institutes. M.ED proposal. Catholic University*.

Lawal,H.(2006).*Teacher Education and the Professional growth of the 21st Century. Nigerian teacher. In the African Symposium. Online. J. Africa. Education* Res.Network.3(2):1-4.

Lockard,J & Abrams,P.D. (2001).*Computers for 21st Century educators.*

Makau,B.(1988) Computers in Kenyan schools. A case study of an innovation in Education. Ottawa: DRC.

Maithya,R.,& Ndebu, S.(2011). *Factors influencing effective use of ICT in teacher education: A case of Kenya Technical Teachers College* Nairobi.

Mishra,P.,& Koechler,M.J.(2004). *Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College record,*108(6) 1017-1054

MoEST *Strategic plan 2006-2010.Republic of Kenya National ICT Strategy for Education and training. Nairob*i. Government press.

Mugenda O.M and Mugenda A.G.(2003). Research *methods. Quantitative and Qualitative approaches. Nairobi. Africa centre for technology studies(*ACTS) press.
Muriithi,P. (2005). *A framework for ICT Integration in teaching and learning process in secondary schools in Kenya.*
Muyaka. (2012). *ICT Infrastructure and Teachers preparation in the integration of ICT in T/L in primary schools and teachers colleges.*
Myndigheten For sko Intveckling.(2008).*Effective use of ICT in schools: Analysis of international research. Stockholm: The Swedish National Agency for school improvement.*
Newton,L.,Rodgers,L.(2003). *Thinking frameworks for planning ICT in science lessons*. *School science Review*,84 (309),113-119.
Ole Shanguya,N.M.(1995). *"Factors relevant to teachers training improvement. A case study of instructional technology in the curriculum of teacher education programme of Kenyatta University*. Toronto.
Orlich,Harder (2001).*Teaching strategies. A guide to better understanding*. Callahan. Gibson.
Pascopella,A.(2001*). Laptop or text book? District administration.37(11). November 2001 pp 54-56.*
Pelgrum,W.J.,& Law, N. (2003). *ICT in education around the world: Trends problems and prospects.* Paris: UNESCO.
Plato (420-348BC). *The republic*.
Robler,M.D.,William,H.,King.F.J.(1988*). Assessing the impact of computer based instructions: A review of recent research computers in schools..Nos ¾.*
Sessional paper No 1.(2005). *Policy framework for education, training and research*. Nairobi. Government printers.
Shamatha,J.H.Peressini,D.,& Meymaris,K.(2004). *Technology supported Mathematics activities situated within an effective learning environment theoretical framework.*
Shear L.,Means B, Gallagher L, House A and Lang worthy.(2009). *ITL Research design: A research conducted by SRI International.*
Steketee,C.(2005*). Integrating ICT as an integral teaching and learning tool into pre-service teacher training courses. Issues in educational research,15(1),101-113.* Retrieved December 3 2009, from htt://www.ii er.org.au/ii er 15/steketee.html.
Tondeur(2007) *Pedagogische studieen* 87,91-104.
Trotter,A.(1999). *Preparing teachers for the digital age: Building the digital curriculum. Editorial projects in Education*,19(4) September 1999,pp 37.
UNESCO.(2007).ICT *In Education in the Asia-pacific region; Progress and plans. Bangkok: UNESCO. Asia-Pacific Regional. Bureau for Education*.
Urwin,T.(2005). *Towards a framework for the use of ICT in teacher training in Africa. The journal of open and distance learning,20(2), 113-129.*
Wadsworth, B.J.(1978) .*Piaget for the classroom teacher*. New York: Longman Inc.
Waema,J,M2005).*In ETA,F.E and Eldoret.L(Eds). A brief history of the development of ICT policy in Kenya .At crossroads ICT policy making in East Africa*. Nairobi. Kenya. East African Educational publishers Ltd.
Wakhaya,Mary,N. (2010). *Influence of the use of ICT on teaching and learning of Mathematics in Secondary schools. A case of Nairobi province, Kenya. A master research project report.* University of Nairobi. Jomo Kenyatta Library.
Wamakote,L.,Ang'odi ,E.K.,& Onguko,B. (2010). *East African Government Investment in Information and Communication technology for Education: Matching Policy to practice itupale. Online journal of African students,2,25-238.*
Wang,Y(2002). *When technology meets belief. Pre-service teacher perception of the teachers role in the classroom with computers. Journal of research on technology in Education, 351 150-162.*
Wellington,J.(2000).*Teaching and learning in secondary science. Contemporary issues and practical approaches. London: Routledge, Tailor & Francis group*.
Zhiting,Z.,& Hanbing,Y.(2001*). ICT and pre-service teacher education. Towards integrated approach. Paper presented at the UNESCO-ACEID International conference on Education: Using ICT for quality teaching, learning and effective management. Bangkok, Thailand. Retrieved Feb 20, 2010* from http://www 2.UNESCO bbk./org/ehb/publications/aceldcon f7/ICT preserve.pdf.

WHAT TEACHERS CAN LEARN FROM THE EXPERIENCES OF INTERNATIONAL STUDENTS: A KENYAN CASE STUDY

Janice Horsager Rasmussen
Africa International University
Janice.rasmussen@africainternational.edu

The experiences of international students in Africa are nearly non-existence in the literature. The study addresses this gap and provides insights for teachers of internationals. In a case study of one private international university in Kenya, I interviewed international graduate students and conducted participant observations. I aimed to understand their perceptions regarding the quality and transformative power of their learning experiences. I found that their previous educational experiences influenced their academic, communication and cultural expectations and experiences in Kenya. For example, low English proficiency plagued some students, as did lack of academic writing and critical thinking skills. Students appreciated teachers who utilized the diverse learning community, gave clear guidance, and mentored them. They valued teachers who linked their teaching to students' past experiences and to their future roles and contexts.

Keywords: International Students, Kenya and Multicultural Education, Graduate Teaching

Introduction

As globalization increases, faculty, students and ideas are crossing borders at faster rates than ever before. Yet, little research has been conducted on the effects of globalization on educational institutions and on students in Africa. International student research has often focused on Africans studying in the USA or in Europe (McLachlan & Justice, 2010;Terkla, Roscoe, & Etish-Andrews, 2007; Zhao & Wildemeersch, 2008) yet there are many international students in Africa.

Africa International University (AIU) in Kenya has consistently attracted international students. Since its inception thirty years ago, typically 19-23% of the student body has been made up of internationals (non-Kenyan passport holders). Faculty too, comes from many countries. At the time of the study, 17 of 26 full-time faculty were not Kenyan (Rasmussen, 2014, p. 4). Initially called Nairobi Evangelical Graduate School of Theology (NEGST) and intended to serve English-speaking Africa, AIU continues to attract students from around Africa and the world. Currently, 174 international students from 28 countries study at AIU ("Africa International University website," 2014).

Research Purpose

Much money, time, and opportunity cost is spent on educating international students. Yet, little is known about the students' learning experiences. What are their expectations and previous experiences when they come? How do these influence their learning at AIU? How do they experience learning at AIU (including the benefits, challenges, and coping skills)? How do they change from their experiences at AIU, if they do change? In an effort to answer these questions, I undertook exploratory research to understand the experiences of international student at AIU. Listening to their voices highlighted the type of support they needed as learners. A deeper understanding of some of their experiences can help AIU teachers improve their teaching of internationals in the future.

Methodology

To better understand the learning experiences of international students at AIU, I designed a qualitative, interpretive research study. I conducted a preliminary study of five international students, after which I revised the study and redesigned and tested the interview guide. I invited all current on-campus master's and doctoral international students living on the AIU campus, who had studied at AIU for at least one term, to participate (N = 34). A sample agreed to be interviewed (n = 13). I interviewed these thirteen international students in 2013.

The sample upheld my desire for nearly maximum variation in program, family status and country of origin. They came from Tanzania, Malawi, Nigeria, South Sudan, Democratic Republic of Congo, Ethiopia, Canada and the USA. Besides Kenya, they had also lived in Mozambique, Zambia, Botswana, South Africa, Egypt, Israel, and the UK. They had studied in 13 countries in various languages, including Arabic, Amharic, Oromo, French, Kiswahili, English and their mother tongues. Likewise, students had been influenced by various colonial educational systems. Students came from a variety of previous schools, including denominational Bible schools, liberal arts colleges, secular universities, schools of ministry, and other theological schools (Rasmussen, 2014).

I also observed and took field notes as a participant in the community for four years as a graduate student and as an International Student Coordinator. After transcribing verbatim and coding all of the interviews and field notes using WEFTQDA software, I identified themes. The themes particularly related to faculty are reported here. The findings on how students changed and the implications for student affairs officials will be reported elsewhere.

This paper will also explore implications of these findings for teachers of international students at AIU. While specific to this institution, others from similar settings may find some of the findings to be cautiously transferable.

Findings

I will discuss my findings using an adaptation of a model (below) developed in the UK, which describes international student experiences in higher education. The three main categories include: academic expectations and study skills, communication issues and language skills, and cultural expectations: roles, values, and intercultural skills.

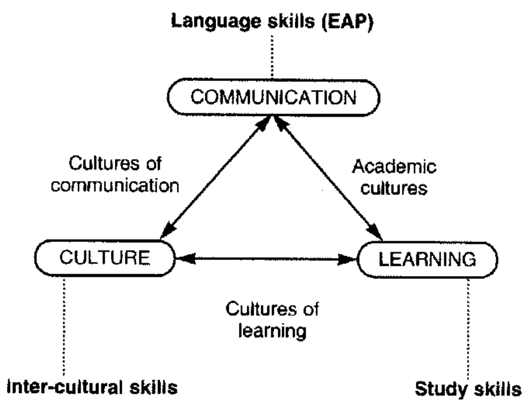


Figure 1: Cultural Infusions in Communication and Learning (EAP = English for Academic Purposes) Reprinted from Cortazzi and Jin 1997, 77

Academic Expectations and Study Skills

Academic institutions create their own micro-cultures, with beliefs, values, expectations, practices and behaviors. These are often implicit, which is confusing for students who have not been a part of that culture. Sometimes they even clash with other academic micro-cultures which may be more familiar to the students (Cortazzi & Jin, 1997, p. 77; Carroll, 2005, pp. 26–27). AIU international students experienced some of these expectation clashes in the structure or learning, the level of learning and the heavy workload.

Structure of learning. Since the structure of learning was different from past experiences, most international students had to adapt their approaches to learning. Many came from systems that provided more guidance, so they had expected more direct teaching from their professors. This gap left them feeling somewhat abandoned. According to one student, "You are teaching yourself, you have to teach yourself. That's the kind of learning process here. They just guide you" (M. Democratic Republic of Congo, 2013).

Classroom cultures at AIU often challenged students to think critically in class. One student admitted, "AIU changed my thinking, yeah, wrestling with professors in class about issues, at times I question myself and never thought that way ... It has just really changed me in thinking a different way" (Y. Malawi, 2013). Some students had come from classes where rote learning was the norm. Students had been expected to recite back information to teachers. They were punished if they questioned their teachers. Classrooms at AIU differed and some Westerners had to learn not to challenge some of their teachers. Some had to adjust from term semesters to terms. Overlapping demands stressed some. For example, many Master's students felt overwhelmed working theses while doing coursework. Doctoral students were surprised to have proposals and competency exams due simultaneously. Grading systems varied from their past experience, so it took time to figure out the meaning of grades. The credit transfer system confused some. Also, some found that deadlines were more flexible than expected.

The small size of classes generally contributed to students' learning at AIU. Small class sizes enabled quality interactions between lecturers and students, and among students. This allowed for varied growth opportunities, such as oral presentations in seminars. Likewise, individualized attention from professors promoted learning.

> The teacher seems to be friendlier than in Congo. They are much more authoritative there. But here ... you contribute, you become more friends, which is, for me, very positive ... You build a course together. You also bring your findings, your discovery on the table. And also I like small classes ... It's give good room for good interaction [*sic*]. (M. Democratic Republic of Congo, 2013)

Being an international university, professors as well as students came from many different educational systems. The variation of standards and expectations between professors confused students. Standards for referencing and writing papers varied from professor to professor. One student observed, "You can have different lecturers; everyone . . . has his own system of writing papers, even of referencing ... We are using Turabian as a main, but some are like parenthetical, some footnotes" (Nigeria, 2013).

Some students felt that professors seemed relatively free to teach as they liked, without much coordination or accountability from the broader system. Some professors sent syllabi out irregularly, without much time to prepare read and write papers for seminar classes. One student complained, "You keep saying, 'write a good paper.' That is somehow confusing . . . but if you give me guidelines, follow these guidelines correctly, then I can do better" (T. Tanzania, 2013).

Level of learning. As is the case anywhere, students felt the difference when they entered into graduate studies, compared to undergraduate levels. Most lecturers pushed them to think more independently and more critically. While this was demanding, they appreciated this approach. At the other end of the spectrum, students had a few teachers who just gave out basic information, did not challenge them, and did not seem prepared to teach at the necessary level. Students varied in their level or preparedness for studies. For some, many classes built on their bachelor's studies. For others, the topics were entirely new.

> One of the least favorites has also been the best. There was one particular assignment

> where we really were pushed . . . using only primary sources . . . we were just groping in the dark to try and figure it out and produce a decent paper, so that was a really tough exercise, but it was also one of the best learning experience, without very much guidance…so it was just kind of being thrown into the deep end. …Most of it was on our own (Canada, 2013).

Heavy workload. Nearly all of the students found the workload and pace daunting. The amounts and levels of reading and writing, along with the proofreading and editing required, shocked many students, although they had heard that AIU would be academically challenging.

> The whole of the first year, I would say that I didn't learn much, because it was just like cramming knowledge in class and even writing papers without digesting... We were given a lot of stuff in a very short period, so before you will digest that, the term is over. You're given another pile of courses and by the end of the day, I didn't know if I was learning. (D. Malawi, 2013)

Students coped with the workload by getting advice, praying, learning to manage their time, and developing their study skills. Some determined to persevere. Others stayed because they dreaded the shame and disappointment they would cause to their families and sponsors if they quit. Some took fewer courses or cut out other activities, such as socializing or time with family. Many found that gradually, they grew accustomed to the system (including the professors, accents, and expectations) and they learned to learn more effectively.

New study skills required. Some students come into AIU with fewer basic study skills than their colleagues, so they were more overwhelmed. For instance, ***s***ome had to learn how to use computers, the library, and Internet resources.

> I struggled like the first three terms. I was like totally confused between the IT, and the library, and the classes and actually in my undergraduate we don't use computers. This was one of the hard things. Sometime I can write and in the middle of my assignment, I lost it. You can just feel the frustration (L. Democratic Republic of Congo, 2013).

Many had to learn to write better and to read faster and more selectively. One student had never done a book review. Another learned about plagiarism the hard way. E-learning was new to many. One noted, "We have been raised in a culture where story-telling is very important . . . you have to ask him [the teacher] questions or her questions. But in e-learning . . . actually it's good, but it is quite challenging" (I. Tanzania, 2013). They appreciated trying e-learning, but they also missed face-to-face interaction with their lecturers.

Communication Issues and Language Skills

Cultures of communication relate to the ways in which people express and interpret ideas in their cultures (Cortazzi & Jin, 1997, p. 76). Language proficiency can be a major stress point for international students, but the actual communication problems can be much deeper, relating to the content being communicated, not just the way in which it is being communicated (Egege & Kutieleh, 2004, pp. 75–76; Hofstede, 1986, pp. 314–316; Lacina, 2002, p. 22). Like many other international students elsewhere, AIU students had to learn new communication skills when they studied at AIU. Academic writing challenged many. Critical thinking, as mentioned above, was a new mode for many.

English difficulties. English proved to be a major challenge for some students, especially those who had not schooled much in English previous to coming to AIU. The high level of academic work, the different schooling systems, and the heavy workload mentioned above compounded this language difficulty. Students who struggled with English felt disadvantaged compared to other students fluent in English.

> That's another challenge, in fact, to write in a good way, since we are from different countries . . . we don't have English. Our people, they do not speak English. But here, since we are from different countries, our teachers, they look to our work, according to their standards or according to the other students, not understanding our problem, or our weakness in English (Ethiopia, 2013).

Students were challenged to various degrees in all of the language skills: listening, writing, reading, and speaking. English is the first language for very few of the students and professors at AIU. Several students could not understand the English accents of certain professors at first, particularly some West Africans and some Americans. Likewise, the differences in vocabulary and pronunciation between American and British confounded some international students. Sometimes teachers switched to Kiswahili or they talked of local places, which also disoriented some international students. Writing high-level papers in English challenged many students. Rewriting, editing, and proofreading required much time and effort, particularly for those who were not fluent in English.

Students found ways to cope with their deficits in English. Many kept a dictionary close at hand. Some found or hired proofreaders. In fact, some sought international friends who would proofread their papers – on campus, through email contacts, or when they studied abroad. One sent his papers to a friend in Australia.

> We sometimes have very complicated books, so coming from French to English – even now, if you go to my desk, I have English dictionary... I normally write slowly. I have to do these things together. So I need much time than my colleagues . . . and I need a proofreader... It's expensive (M. Democratic Republic of Congo, 2013).

For many students, improving their English was one of their goals in attending AIU. Some students from Rwanda or the Democratic Republic of Congo had study options in French, but they felt AIU was superior and they wanted better English in order to access more materials. Some sought international friends and attended English church services to improve their fluency.

Cultural Expectations: Roles, Values, and Intercultural Skills

The culture of the learning environment relates to expectations in the classroom, roles of students and teachers, basic values and beliefs regarding learning and teaching. Issues of pedagogy and assessment are also important parts of cultures of learning (Cortazzi & Jin, 1997, p. 76, 85).

Credible, diverse faculty. Though challenging to figure out at first, many students came to value the international diversity and exposure from their AIU professors. One student reported, "I've been really blessed by the professors and the range of professors. Like last term, I had a South Korean, Kenyan, West African, and an American… that wouldn't happen in too many other places" (USA, 2013). Their different experiences and approaches to teaching enhanced the learning process. Many AIU professors had also been international students. Doctoral students appreciated working with well-known visiting professors/authors. Others liked the credibility of professors who were missionaries teaching missions classes.

Several metaphors surfaced to describe faculty. One was seen as a father. He taught a difficult subject, but a model in patience and encouragement to his students. Others were referred to as elders or gurus.

> He was like a father, a teacher, very encouraging... I like that approach. It challenged

> myself, if I will be a teacher, or a pastor, tried to care for those who are down, those who they don't think they can do something. So that was a good experience to learn from my lecturer [*sic*]. (P. Tanzania, 2013).

Approachable faculty. Students' views on their professors were often noted in comparison with their past experiences. This was especially noted in the area of power distances (Hofstede, 1986, p. 307) expected between professors (and their spouses) and students. Most found the faculty at AIU friendly, approachable and available.

> This is one university that I learn that it is possible for me to interact with your professors one on one, to take tea together. In my background, is almost impossible... The system here kind of creates an atmosphere where you can chat... you can express yourself more freely to the professor. He will even ask you questions... It is open and the professors themselves are also hoping to engage you (Nigeria, 2013).

Students often found teachers who were willing to mentor them, though not all faculty was so available. They appreciated being included in conferences and professional networks as well as getting experience teaching and researching with faculty.

> So the faculty, most of them, have been very, very generous and gone out of their way to give advice and counsel outside of the classroom which has been very, very helpful, ... more mentoring. They have given the students the feeling that we're more like colleagues than a strict teacher-student division... I wasn't expecting it would be that collegial (Canada, 2013).

Contextualized African teaching. Having various Africans teaching on African issues within an African context brought authenticity to the learning process. Dealing with real African issues assisted students in thinking through their worldviews and their own responses to these issues.

> But coming here to this school, AIU, I found it taking me back to my roots . . . the courses that I've taken here, the lecturers. They really push us back to our African roots to value our culture, to appreciate a lot of cultural aspects of our communities (D. Malawi, 2013).

Learning in an international community. In addition to faculty, students appreciated the community of learning and their fellow students. Small class sizes lent themselves to frequent discussions in class. They learned from each other's experiences and perspectives, in class and outside of class. As one student expressed this, "I've really appreciated knowing classmates... It's been really good, the benefits of learning here and understanding spiritual points of view from classmates. That's been really rich" (USA, 2013).

Since most of the full-time international students lived on the AIU campus, they had numerous opportunities to interact. They made friends and developed international networks. Learning and living in an international, inter-denominational community required some adjustments. Several students experienced some xenophobia. Students came from many different denominations and educational backgrounds. They came with differing perspectives and experiences. Along with bringing some sense of disequilibrium, these differences provided opportunities for growth.

> You get to know how other people approach life from their different countries and how they see what you don't see, through interaction with one another, learning from what they are doing out there to their countries, how they approach life, how they see things,

how their system in education (P. Tanzania, 2013).

Summary and Discussion of Findings

International Student Research

In summary, international students at AIU experienced many issues common to international students elsewhere, but they also faced some unique situations.

Like others, they were initially quite disoriented by the different system of learning. AIU's unique mix of international influences (American, British, French, and Kenyan) probably made it more difficult for students to figure out compared with some other more homogenous places. As in other places, the new role expectations of teachers and students mystified many at first (McLachlan & Justice, 2010, pp. 37–54). International graduate students' experiences are rarely studied, but one study at Trinity International University noted similar challenges and benefits for their theological graduate students (Charter, Guth, Lopes, & Theonugraha, 2010).

Other internationals also struggled to learn to think critically and write academically. When teachers taught these explicitly, as helpful tools to survive university, students often learned them (Egege & Kutieleh, 2004, pp. 77–81; Davies, 2006, pp. 16–37).

Like others, language difficulties challenged many throughout their studies. They may have had less English support than at some other bigger, more resourced international universities (Cammish, 1997, pp. 143–146). Still, they gradually improved their English. The heavy workload of graduate school was compounded by language challenges for many.

Generally, Kenyans were seen to be friendlier to internationals than hosts in some others places. Compared to studies elsewhere, these international students reported less racism, although some Westerners felt some xenophobia (Terkla et al., 2007, p. 1; Zhao & Wildemeersch, 2008, p. 57). Off campus, African internationals also felt some discrimination.

Like other internationals, students encountered cultural differences in class and living on campus, such as variations in time/event orientations, individual/communal orientations, power distance variations, and varying levels of tolerance towards ambiguity (Hofstede, 1986, pp. 307–310). Though uncomfortable, they adapted to some of these differences. For example, individualistic students learned to appreciate study groups. Teachers were more approachable and accessible than students from high power distance cultures expected. Deadlines were renegotiated with teachers. Students requested more specific guidelines when needed. Also, the disorientation students feel can lead to transformative learning (Mezirow, 1991, pp. 168–169) if teachers utilize it and provide scaffolding and support.

Like many internationals, they broadened their perspectives and networks by studying internationally. Close, continual interactions with fellow students and faculty influenced these changes. Students appreciated the African focus of their studies, which was not the case for many international students studying abroad (Hyams-Ssekasi, 2012, p. 197; Noronha, 1992, pp. 57–58; Barker, 1997, pp. 109–112).

Multicultural Pedagogies

Hofstede (1986) points out four common problem areas when teachers and students from quite different cultures meet. They will likely encounter (1) differences in the social positions of student and teachers; (2) differences in the content being taught; (3) difference in the cognitive styles/abilities and; (4) differences in the expectations for interaction processes between teachers and students. His work showed that teachers tend to favor the work of students whose values closely resemble their own (pp. 303–306).

To bridge the gap, Hofstede recommends (a) teaching the learner to learn; (b) teaching the teacher how to teach. Teachers must first understand their own cultures and then recognize that others learn in different ways. His anthropological approach to teaching embraces the world's cultural variety (p. 316). Similarly, Cortazzi and Jin (1987) advocate aiming for *cultural synergy* when teaching, where teachers and students try to understand the other's principles of interpretation. The goal is not to make all students conform to the teacher's way of learning. Rather, because, international students will likely go back to their home cultures, teachers and students can learn from each other while still maintaining and affirming each other's cultural identity (pp. 88–89).

As a starting point, many experts recommend becoming a critically reflective teacher to improve one's teaching of international students. The teacher, as well as the students, aims to become multicultural. To do this, teachers much examine their own assumptions. They must recognize the cultural underpinnings of their own teaching and assessments, including their subliminal expectations. They then must reflect on how these may affect others from different groups. This can help teachers decide what is essential and what can be adapted to suit the needs of their students (Carroll, 2005, pp. 27–28; Ryan, 2005, p. 96; Weinstein & Obear, 1992, pp. 41–61; Ramsay, 2005, p. 22; Ford & Dillard, 1996, pp. 232–236; Banks, 2001, p. 64; McLaren & Sleeter, 1995, pp. 35–45; Gorski, 2010, pp. 2–4).

Pedagogical Implications

Teachers can improve their teaching of international students. Below are a few suggestions for teachers, based on the voices of these international students at AIU.

Academic Expectations and Study Skills

1. Teach needed skills explicitly, such as academic writing and critical thinking skills.
2. Give clear guidelines and expectations for learning (i.e., rubrics, assignments).
3. Encourage students to learn from each other (i.e., discussions, study groups).
4. Use a variety of methods.
5. Apply content to students' contexts (i.e., Africa, home country of students).
6. Prioritize the most important readings and assignments.

Communication Issues and Language Skills

1. Speak clearly and audibly.
2. Write the main points down to reinforce learning when lecturing.
3. Refer students to language support services and lobby for more assistance.

Cultural Expectations: Roles, Values, and Intercultural Skills

1. Explore students' past experiences and expectations for student and teacher roles.
2. Learn about students' contexts, where they will apply their learning back home.
3. Critically reflect on your own values, beliefs, experiences and teaching practices.
4. Utilize the international community as a learning environment.
5. View disorienting dilemmas as learning opportunities.
6. Provide students with support and scaffolding to enable transformative learning.
7. Be a positive role model. Be available outside class. Mentor students.

International students, particularly at the graduate level, come into their learning experiences from many different systems of learning. These color their expectations of learning and the corresponding ideas about roles and expectations of teachers and students. They come with their own life histories (Merriam, Caffarella and Baumgartner 2007, 212). They bring their culture and many of its values. Teachers need to be aware of these past experiences. They need to link their present teaching with the past. Then they need to help students link their present learning with their future roles. They can help students apply the learning to their contexts so that they can better put it to use when they return home.

Acknowledgements

My deep appreciation goes to all of the international students from AIU whose stories informed this research.

References

Africa International University website (2014, November 26). Retrieved from http://www.aiu.ac.ke/

Banks, J. A. (2001). *Cultural diversity and education: Foundations, curriculum, and teaching*. Needham Heights, MA: Allyn and Bacon.

Barker, J. (1997). The purpose of study, attitudes to study and staff-student relationships. In D. McNamara & R. Harris (Eds.), *Overseas students in higher education: Issues in teaching and learning* (pp. 108–123). London: Routledge.

Cammish, N. K. (1997). Through a glass darkly: problems of studying at advanced level through the medium of English. In *Overseas students in higher education: Issues in teaching and learning* (pp. 143–155). London: Routledge.

Canada, P. (2013, April 29). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Carroll, J. (2005). Strategies for becoming more explicit. In *Teaching international students: Improving learning for all* (pp. 26–34). London: Routledge.

Charter, M., Guth, C., Lopes, C., & Theonugraha, F. (2010, October). *Communicating for learning across cultures*. Summary of findings from phase one of research, Trinity Evangelical Divinity School, Chicago.

Cortazzi, M., & Jin, L. (1997). Communication for learning across cultures. In D. McNamara & R. Harris (Eds.), *Overseas students in higher education: Issues in teaching and learning* (pp. 76–90). London: Routledge.

Davies, W. M. (2006, December 12). Cognitive contours: recent work on cross-cultural psychology and its relevance for education [Springer Science + Business Media B.V. 2006].

Democratic Republic of Congo, L. (2013, May 13). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Democratic Republic of Congo, M. (2013, May 20). Interview by J. H. Rasmussen [digital recording].Learning experiences at AIU.

Egege, S., & Kutieleh, S. (2004). Critical thinking: Teaching foreign notions to foreign students. *International Education Journal, no. 4*, 75–85.

Ethiopia, E. (2013, April 26). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Ford, T. L., & Dillard, C. B. (1996). Becoming multicultural: A recursive process of self-and social construction. *Theory into Practice*, *35*(no. 4), 232–238.

Gorski, P. C. (2010). The scholarship informing the practice: Multicultural teacher education philosophy and practice in the United States. *International Journal of Multi-Cultural Education, 12*(2).

Hofstede, G. (1986). Cultural differences in teaching and learning. *International Journal of Intercultural Relations*, *10*, 301–320.

Hyams-Ssekasi, D. (2012). *The transition of international Sub-Saharan African students into the UK university system with reference to a university in the north of England.* (Doctoral dissertation). University of Huddersfield, UK, Huddersfield, UK. Retrieved from http://eprints.hud.ac.uk/16428/

Lacina, J. G. (2002). Preparing international students for a successful social experience in higher education. *New Directions for Higher Education, Internationalizing higher education: building vital programs on campuses* (117), 21–27.

Malawi, D. (2013, May 27). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Malawi, Y. (2013, May 10). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

McLachlan, D. A., & Justice, J. (2010). A grounded theory of international student well-being. *The Journal of Theory Construction and Testing*, *13*(1), 27–32.

McLaren, P., & Sleeter, C. E. (1995). Introduction: Exploring connections to build a critical multiculturalism. In *Multicultural education, critical pedagogy and the politics of difference* (pp. 5–32). Albany, NY: State University of New York.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L. M. (2007). *Learning in adulthood: A comprehensive guide* (3rd ed.). San Francisco, CA: Jossey-Bass.

Mezirow, J. (1991). *Transformative dimensions of adult learning*. San Francisco, CA: Jossey-Bass.

Nigeria, M. (2013, May 15). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Noronha, J. (1992). International and multicultural education: Unrelated adversaries or successful partners? *New Directions for Teaching and Learning*, *Promoting diversity in college classrooms: Innovative responses for the curriculum, faculty, and institutions* (no. 52), 53–59.

Ramsay, N. J. (2005). Teaching effectively in racially and culturally diverse classrooms. *Teaching Theology and Religion, 8*(no. 1), 18–23.

Rasmussen, J. R. H. (2014, May 3). *Learning experiences of international students at Africa International University*. (unpublished MPhil thesis draft), Africa International University.

Ryan, J. (2005). Improving teaching and learning practices for international students. In J. Carroll & J. Ryan (Eds.), *Teaching international students: Improving learning for all* (pp. 92–100). London: Routledge.

Tanzania, I. (2013, May 20). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Tanzania, P. (2013, May 8). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Tanzania, T. (2013, May 3). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Terkla, D. G., Roscoe, H. S., & Etish-Andrews, J. (2007). Voices from around the world: International undergraduate student experiences. *Association for Institutional Research (AIR) Professional File*, (104), 1–12.

USA, Y. (2013, May 20). Interview by J. H. Rasmussen [digital recording]. Learning experiences at AIU.

Weinstein, G., & Obear, K. (1992). Bias issues in the classroom: Encounters with the teaching self. *New Directions for Teaching and Learning*, *no. 52* (Promoting diversity in college classrooms: Innovative responses for the curriculum, faculty, and institutions), 39–50.

Zhao, M., & Wildemeersch, D. (2008). Hosting foreign students in European universities. *European Education*, *40*(1), 51–62.

TECHNICAL TEACHER TRAINING VIA eLEARNING IN MOZAMBIQUE

Alexander Romiszowski
Syracuse University
ajromisz@syr.edu

Halénio Nualia
Instituto Superior Dom Bosco, Mozambique

This paper describes a project in Mozambique to design and implement a teacher-training program in the Technical and Vocational Education and Training (TVET) sector via eLearning. This competency-based program forms part of Mozambique's National Vocational Qualifications (NVQs) for technical teacher training. The objectives are to enhance the skills of practicing technical teachers in course and program design, development and implementation, and in the management of TVET courses, programs and institutions. The implementing agency is the "Instituto Superior Dom Bosco" (ISDB), a leading technical teacher training institution in Mozambique. Due to the geographically distributed and already-employed nature of the target audience, eLearning is the principal delivery mode. The program has a blended-learning format, some 80% to be delivered online via Moodle and 20% via attendance at the ISDB.

Keywords: TVET, Teacher Training, eLearning

Use of Distance Learning for Teacher Training in Mozambique – A Review

The project described in this paper is part of a broader initiative by the Dom Bosco Higher Institute (Instituto Superior Dom Bosco – ISDB) to use open and distance learning (ODL) for technical and vocational education and training (TVET). However, this project has not been launched to fill a vacuum – distance learning has for some time been employed in other teacher training projects. In this first section, by way of an introduction, we present information on some of the past and current distance education projects for teacher training and professional development in Mozambique which have in some ways influenced the design and served to set the context of the current project.

Instituto de Aperfeicoamento de Professores (IAP) – Institute for Teacher Upgrading

This program resulted from a decision within the Education Ministry in Mozambique in the early 1980s to upgrade the skills of the lowest level (many not formally qualified) teachers, who were teaching in the first four years of primary schools. At the time they made up around half of the total school teaching population. The program was supported by the Ministry of Education, UNESCO and the "Instituto de Radio-Difusão Educativa da Bahia (IRDEB), an educational radio institution based in Salvador, Brazil. Some training was also carried out by the International Extension College, UK. A course production team was trained in print and radio materials production and in the running and evaluation of distance teaching activities. Courses began in 1984 and ran until 1987. Courses comprised printed materials, radio broadcasts, self-help groups of students and field tutors, each responsible for 60 learners. The media-mix, especially the use of community radio, and the method of implementation and management were based on the model used by IRDEB in Brazil.

This project stopped after two years or so, for several reasons: a rapidly worsening security situation in the country which also lowered financial resources available to ministries and led to massive budget cuts; distance education materials production could not keep up with the pace of the more motivated students; the planned re-grading of successful candidates did not take place, apparently because a different part of the Ministry would not legalize the training for the purpose of staff grading and salaries (Matangala, 1988).

A new version of the IAP programme was a planned during 1994-96 and was initially launched in five provinces, with 112 study centres. Fifty study modules were produced, divided into professional modules and general training. Some twenty people were employed on the writing of the materials, which were print-based. This version no longer used radio broadcasts as part of its media mix. This new project, which received support of the Centre for Educational Technology from Brasilia (CETEP), UNESCO, the World Bank and UNDP, is still in operation and has trained many thousands of primary school teachers.

Instituto de Formacao Bancaria de Moçambique (IFBM) – Institute of Bank Training

The IFBM is a private-sector institute that for a long time has been offering relevant courses to the banking and financial sectors through both conventional and distance delivery modes. Their distance education courses initially used printed learning materials from a Portuguese bank training institute and adapted them to the requirements of Mozambican banking and financial institutions. Training began in 1994 with 650 students and the first graduates finished in 1996.

The same Portuguese banking training organization later supplied online versions of their courses and gave technical assistance in the installation and management of the Moodle platform. The courses have now been offered in an eLearning mode for over a decade. This was one of the first projects in the country to utilize eLearning and the Moodle platform for vocational training.

In 2008 and 2009, the present author gave a workshop and helped to form an in-house course development team. Several further courses have now been developed locally and are offered to the banking and financial sectors. Although this IFBM project is quite small-scale, it has trained significant numbers of students and also course tutors and, therefore, has served as a model for other projects now being planned and implemented by other professional training organizations.

English Secondary School Teachers Upgrading Programme

This project was initially coordinated by the Ministry of Education’s Secondary School Directorate. Responsibility was later transferred to the Pedagogical University (Universidade Pedagógica - UP). The aim was to upgrade all English teachers in secondary schools and to revise the English curriculum in schools with textbooks and resources. Provincial supervisors/advisors worked in each of ten provinces, and there was a Study Centre in each province. This project was managed by UP, which operates a network of provincial study centres and is also engaged in other distance education initiatives, some of which are described below.

Secondary School Teacher Training in French and Mathematics

These were really two separate projects, but both were executed by the Pedagogical University (UP) and both were initially supported financially and technically by France. The projects are aimed at trainee teachers in the regular pre-service secondary teacher education program. UP students use self-study materials at home, supported by tuition at a distance, to improve their French language and Mathematics skills, but continue to study the pedagogical subjects of their program in the conventional classroom based mode.

This project is interesting in the present context for several reasons: it represents a dual-mode, or blended-learning, approach to course delivery; it uses teaching materials that have been imported from abroad (France) and therefore have to be translated and also adapted to local educational and cultural differences. Therefore, this project has served as a practical case example of “repurposing” (reusing) pre-existing learning materials. The current project being implemented by the ISDB also has a blended-learning design and also seeks to adopt and adapt existing learning materials whenever and wherever this is viable.

Bachelors in Education Degrees for Secondary School Teacher Qualification

The Pedagogical University (UP) was also active from 2001- onwards with plans to implement in-service secondary school teacher training via distance education. During 2002 and 2003, supported by the World Bank, the present author worked with UP staff on the design of shorter-term Bachelor of Education degrees, each of which would act as a teacher qualification in a specific subject area. This project was to be implemented in both "face-to-face" (F2F) and distance-learning (DL) delivery formats. The F2F version was implemented during that decade, but practical and political difficulties delayed implementation of the distance delivered version. However, some of the courses are now being offered online (also via Moodle).

Technical Teacher Training via eLearning at the ISDB

Instituto Superior Dom Bosco (ISDB)

The ISDB is a Technical and Vocational Education and Training (TVET) institution offering regular campus based and also some distance-delivered courses in skill areas such as: Mechanical and Electrical maintenance/repair; Business Administration and Accounting; Hotel and Tourism; Agricultural and Fishing. The ISDB is also one of Mozambique's most important technical teacher training institutions. It has implemented a strategy to facilitate access and grow enrolment in its programmes through the use of ODL, through conversion of existing classroom-based courses to a distance-delivered format, so reaching a larger audience by offering both versions. The ODL courses that are already implemented use printed modules supported by remote tutors, not unlike the model originally employed by many "first generation" ODL institutions.

Plans are currently in place for progression from this print-based and direct-tutor-contact-supported model of ODL to an eLearning model, with courses delivered via Moodle. The first of these is to be a blended-learning version (approximately 20% face-to-face and 80% online) of a nationally recognized TVET teacher training qualification known as "Certificado A". This is the most advanced level of TVET teacher qualification defined in the Mozambican system of national vocational qualifications (NVQs). The agency responsible for accrediting the NVQs calls "Certificado A" the "course for the training of "teacher-leaders". This course is preceded in the NVQ structure by two courses of a lower level, the B and C certificates, which address the development of lesson planning and teaching competencies.

The "Certificado A" Curriculum and Structure

The "A level certificate" curriculum is recognized by the relevant ministries as a higher education certificate, so the credits gained are equivalent to university credits. To gain the qualification, the candidate must complete fifty credits. In its conventional form, the qualification programme prescribes over 1200 hours, approximately half devoted to classroom-based study and half to on-the-job experience or "work performance". Table 1 shows the structure of the programme.

Table 1. Structure of the Certificado A Programme

PROGRAMME COMPONENTS	# MODULES	Credits (min.)	Hours
Obligatory (common-core)	7 (study all 7)	23	550
Optional / elective	4 (study 2)	5	120
Work performance	(see below)	22 (18+4)	600
TOTAL	11 (study 9)	50	1270

The "work performance" component has two parts, to be monitored and evaluated on-the-job. The first (worth 18 credits) is the individual's self-development as a professional. The second (worth 4 credits) is evaluation of a project that involves the planning, implementation and management of an internship programme. This "work performance" has less to do with classroom or workshop teaching skills (which are practiced in the C and B level certificate programmes) and more with the skills of planning and management of training courses, whole programmes and even TVET institutions.

As such, the Certificado A is well suited to be transformed into a distance delivered format, as these types of practical activities can be more easily incorporated in self-instructional materials or online exercises and discussion activities. Also, the target audience for this course is composed of practicing TVET professionals, employed in TVET institutions located at different points across the nation and with responsibilities that make it difficult, if not impossible, to participate fully in a conventional, place-based, programme of professional development. Therefore, ODL is the most viable course delivery option.

The prescribed minimum study/qualification time is one academic year (47 weeks – 670 class hours and 600 job experience hours). In the pre-existing conventional delivery mode, full-time study has typically been organized as either (a) 28 class hours / week during a 24 week semester, followed by a 23 week semester working full-time on-the-job, or (b) 14 class hours/ week during 47 weeks, plus work experience on-the-job for the same 47 weeks at 13 hrs./week minimum. It is also possible to take the qualification on a part-time basis over periods longer than one year. However, as most of the potential candidates are already practicing teachers, working in TVET institutions spread around the country, the ISDB is planning to offer a blended-learning version lasting one year but with only 6 weeks of study on campus and the remainder online via Moodle – plus the on-job work experience component. This initiative has received some financial support from the World Bank through the PIREP programme of TVET reform.

Table 2. Modules of the Certificado A Programme.

01. Plan, organize and coordinate the evaluation of on-the-job competencies	core – 3cr.
02. Develop and integrate “advanced” teaching, facilitation and learning methods	core – 3cr.
03. Plan and develop learning strategies	elective – 3cr
04. Develop curricula and learning programmes	core – 3cr.
05. Quality management and assurance in TVET institutions	core – 4cr.
06. Lead and coordinate the process of implementing a qualification	core – 4cr.
07. Provide professional counselling	core – 3cr.
08. Develop TVET policies and procedures	core – 4cr.
09. Develop new ideas and innovations in/for TVET institutions	elective – 3cr
10. Plan, organize and implement workplace health and safety norms/procedures	elective – 3cr
11. Establish and manage training services provider contracts	elective – 2cr

Design, Development and Implementation of the Online Course Modules

In order to design and develop the learning materials and exercises needed to implement the course, and to do this to a relatively tight timescale, a combination of in-house and sub-contracted resources was employed. The ISDB created an in-house course design/development team of twelve of its teaching staff members, seconded part-time to the project. This team, working usually in six pairs but sometimes also as a large group, undertook the preparation of six of the modules. The five remaining modules were outsourced to faculty members at other educational institutions who possessed experience and expertise in both the specific topics of the outsourced modules and the conduct of courses via ODL.

This two pronged approach was encouraged by the ministerial organs supporting the project and was facilitated by their financing of the work performed by the external authors. One effect of this, however, was a division of the design/development stages of the project into two parts, one directly and intimately planned and managed by the ISDB and the other largely beyond the ISDB's control – a situation which may possibly prove to be problematic later in the course implementation and management stages when the ISDB would be 100% responsible for the project. One immediate result was that the ISDB found itself responsible for the training and professional development of its in-house team but not the external authors. The remainder of this section therefore describes the process of training and development of only the team of twelve in-house authors.

The ISDB team was composed of a cross section of teaching staff members from different TVET programmes offered by the institution. One of these is technical teacher training and, naturally, the staff members seconded from this programme have experience and expertise in pedagogy, educational psychology and other relevant disciplines. But the majority of those seconded from the other technical programmes are well qualified and experienced in the content of their respective technical subjects but only somewhat, or not at all, in the areas of relevance to an ODL project. And none of the team had any previous experience in the design and development of training for delivery via Moodle or indeed any online platform. The ISDB therefore sought assistance from the Commonwealth of Learning (COL) to design and implement relevant training for the in-house team. The resultant training was implemented jointly by the current authors, one as external consultant/trainer and the other as in-house project manager.

Training the Course Designers

The training programme was composed of two parts: (a) Design, Development and Evaluation of ODL Courses; (b) Creating, Using and Managing a Moodle-based Course. Each of the parts was composed of 6 half-day sessions over a 3-week period, with additional project-based practical activities to be completed by participants between the sessions.

Part A started with a review of learning theories and other sciences that underpin systematic and systemic ODL course design, and then described and practiced the process in detail. The stages of this process were summarized by the acronym **LADDERS –** a modification, of the **ADDIE** instructional design model which makes particular sense in the context of ODL.

L – Learning: From learning theory and research to teaching, tutoring and facilitating strategies; Adult learning theories and adult teaching strategies; Instructional Design and Development models and how to use them in the context of ODL.

A – Analysis: Analysis of learning needs (including front-end analysis of project viability); Defining Objectives, Performance Indicators and Measuring Instruments; Task, Topic and Target population analysis for identifying course content, sequence and structure.

D – Design: Selecting instructional strategies for specific categories of objectives; defining and sequencing the units and modules within a course; designing detailed lesson plans, practice exercises, storyboards and scripts.

D – Development: Writing instructional materials in a systematic manner; writing, directing and recording audio and A/V sequences; use of specialized materials development techniques such as Information Mapping and Structural Communication.

E – Evaluation: Developmental testing procedures for evaluating / improving instructional materials and media before implementation of the course; field-testing procedures for evaluation of instructional materials and whole course units in real-life contexts.

R – Review and Revision for Quality Assurance: The "Rolling Remake" approach to materials, course and programme improvement; Management of instructional design teams to ensure quality and timeliness of the materials design and development process.

S – Scaling-up and Sustainability: Scale effect as it relates to education systems; Ensuring that the course will "survive and prosper" as it is implemented on a large scale; Applying a Systems Approach to the implementation and management of ODL courses.

Part B explained and provided practice in the more technical aspects of creating, using and managing an online course installed in Moodle. This was structured as six half-day modules:

Module 1: Course Management Systems; what makes Moodle special; Using Moodle and learning how to navigate a course and how to add content to a course.

Module 2: Course management procedures, including the following topics: understanding and using roles; arranging students into groups; how to obtain reports of student activity; etc.

Module 3: Use of the communication and interaction tools available in Moodle: how and when to use forums, hold chat sessions, send messages; how the online tutor or facilitator should act to motivate and support the learners in online interactive activities.

Module 4: How to create and when to use quizzes and many different types of online and offline assignments; Roles and competencies of the online tutor / facilitator in the process of assessing and evaluating learning outcomes in Moodle-based Courses, etc.

Module 5: Integration the various tools available in Moodle: How online exercises and assignments are integrated into learning objects, how these form competency-based lessons and how the lessons may be integrated into totally online or blended courses.

Module 6: Some of the additional "optional" learning resources built into Moodle: shared glossaries and databases; collaboratively developed web pages; wikis; blogs; surveys and polls; systems for recording student grades; etc.

The Course Design and Development Process – and Some Sources of Problems

By and large, it was noticed that the team members as a whole experienced less difficulty in mastering the technical skills of using the Moodle platform and its available tools than the planning skills of designing the materials and interactive exercises which were to be made available online. The team members were all practicing teachers, with much experience of teaching in the conventional classroom and practical workshop based manner. Most have had difficulty in adapting their pedagogical approaches and skills to the online learning environment. The materials that the teams initially wrote tended to have the characteristics of written text for private reading or lecture notes to be used as reference materials. It took some time for the authors to move from the mental set of "what am I, as teacher, going to say" to the alternative mind-set of "what should **they**, as learners, do in order to learn and to show me how well they have learnt".

This was further complicated by some administrative aspects of the project. The team was working from the "Certificado A" curriculum which had already been elaborated and approved by the Ministry of Education's/World Bank's PIREP project some years before, when there were no plans in place to offer this qualification via online learning. Naturally, the design of the curriculum and its documentation was influenced by the planned delivery mode. Furthermore, the methodology adopted by the PIREP project for the development of support documentation for the NVQs included the preparation of a course manual to a standard presentation format and also lesson plans (for conventional classroom/workshop based delivery). It so happens that these two final components of NVQ documentation had not yet been developed for the “Certificado A”. Therefore, the responsible Ministry organ, COREP, requested that in the process of preparing the courses for the online version of this programme, the ISDB should also prepare these documents so that other teacher training institutions interested in offering this qualification would have available a complete set of NVQ documentation.

As COREP was also a source of part of the funding for this project, it seems that the request was interpreted as an order, with the result that the team members understood that the development of material for the conventional version of the courses was a part, and indeed the first and possibly most important part, of their assignment. During the weeks that followed the conclusion of the initial training, most of the module teams spent much of their time and effort on designing and developing the materials for conventional delivery of the courses, which slowed down progress on the online version.

This diversion of the efforts of the course designer-developers has now been corrected. However, the module designers are, by and large, only now practicing the skills and procedure of online course design and development which they studied in the course some months previously. Some re-learning of forgotten concepts and procedures is therefore still taking place.

The Course Implementation Process – and Further Problems

Implementation of the materials in Moodle was to begin immediately after the initial training of the team members. However, several problems conspired to delay this. First, as described above, the first batches of course materials written by the team members followed a conventional reference-manual format and so were almost devoid of interactive exercises and activities that would be appropriate for incorporation in Moodle. Further informal on-the-job training of the authors was provided over a period of several months. In part, this was given by the consultant in the form of additional whole-group sessions, some incorporating participation at a distance (from Brazil) of experienced designer/developers of courses already implemented in Moodle (i.e. ODL skills taught by means of ODL).

Much of this additional training was, however, given to the individual module authors by means of analysis and evaluation of the materials they were writing, followed by appropriate feedback. This was initially conducted either in personal meetings, or at times when the consultant was not available to visit the ISDB, by means of sharing the materials as email attachments. At this time, the Moodle platform which had been installed on the ISDB server was not accessible remotely via the Internet, so interaction via email was the only available mode. Once the accessibility problem was resolved, the consultant proceeded to interact with the team members by accessing the materials they had developed as they attempted to install them in Moodle. However, this procedure broke down after only a few weeks, due to a serious virus or malware attack on the main ISDB website which put it out of action for a period of several months (a long time because the website was completely redesigned in the process – see below).

This problem and the length of time taken to fix it is indicative of the somewhat precarious nature of the virtual environment which is to deliver the courses to the remotely distributed students. The problem was caused not so much by the ISDB technology infrastructure, but mainly by defects in the country’s overall IT infrastructure within which the ISDB and other users and providers of online services currently have to operate. However, when the problem occurred it was diagnosed that the level of protection of the ISDB server against such external threats and problems was precarious and should be improved. This diagnosis has led to a total redesign of the ISDB website – a process which took several months to complete, in part as a result of the lack of experienced and competent IT system design and maintenance staff. In the event, the ISDB first contracted technical assistance from local sources and then from providers located in Portugal, so the overall process of redesigning the website and the IT infrastructure took some considerable time to complete.

This process also involved the re-installation of Moodle and all the materials that had previously been installed. As a consequence, the interactions between the consultant and the ISDB team members had to continue once more on the basis of interchange and analysis of written documents via email. All these issues have contributed to delays in the planned schedule for implementation of the “Certificado A” courses. Aspects that have suffered exceptional delay include the installation of pre-recorded audio or A/V multimedia components and the developmental testing of the discussion forum, chat and other interactive and collaborative learning components of the planned courses.

The above mentioned technical problems have now been resolved and the consultant is once more able to access the installed course components remotely and interact with the respective authors directly via the Moodle platform. However, at the time of writing this paper, the time and progress lost during recent months has not been fully recovered, so the “Certificado A” programme is not yet ready to be used by the intended students. It is therefore too early to comment here on the successes and eventual problems encountered during the full scale implementation and use of the new online programme. We hope and expect that by the time of the conference in Nairobi in July, we will have some results to report.

Final Comments: Lessons Learnt so far and Lessons yet to be Learnt

The problems and issues encountered in the execution of the project so far can be classified in three categories: difficulties in learning new skills; problems and issues of a technical nature; administrative/political issues. We can also foresee further problems and issues in each of these three categories as the project moves into the phase of full-scale implementation. The following section discusses the lessons learnt and the further lessons we may have to learn as we proceed.

Learning the Skills of Online Course Design and Development – Also of Course Delivery

The problems and issues related to learning have been mainly to do with modifying the mind-set of the teaching staff members who are acting as course designers. Due to their years of experience as technical teachers and TVET teacher trainers, but always in a conventional classroom and workshop based environment, they have strongly engrained ideas and habits which have proved to be surprisingly resistant to change and adaptation to the needs of planning a course for delivery online. For example, it has taken some time for the designers to realize what is feasible and what is difficult for an online tutor to accomplish – early versions of some course modules created so many discussion forum exercises that no course tutor would be able to access and read all of them even if working overtime seven days a week – other modules would include inadequate and inappropriate learning activities, unrelated to the nature of the learning objectives to be achieved, just because they seemed to be “fun”. Such “design errors” are no doubt the result of a lack of previous experience not only of designing eLearning but also of acting as tutors in online courses.

This raises the question of what future problems and issues may arise, given that the tutors who will be involved may not all be the same staff members who were engaged in the course design process. An aspect of the project that still requires attention is to provide appropriate and adequate training for those who will be involved in interacting with the course participants and evaluating their performance both in terms of the process of learning and in terms of the learning outcomes. The project must still prepare and implement adequate train-the-online-trainer activities.

Technical Problems at Micro and Macro System Levels

The technical problems and issues encountered so far have been principally related to the design of the IT infrastructure available for the project and the resolution of problems of security. Lessons have been learnt on the importance of a sound IT design for the proposed delivery system. As regards the use of Moodle, few major problems have been encountered so far. The staff currently engaged on the project had little difficulty in learning to use the basic tools built into Moodle. However, as the nature of the exercises they design becomes more sophisticated, they will start to use other ancillary software packages (e.g. for the preparation of interactive multimedia, simulations and serious games, as well as more sophisticated means of evaluation) and then they will meet a series of new learning challenges.

As regards the IT infrastructure, new problems and issues will probably be experienced as the sophistication of the planned learning exercises increases. Doubts are being expressed as to whether the bandwidth available to the participating students will allow for synchronous live discussion activities, whether interactive simulations and games will run at the required speed of reaction and screen refreshment, whether video clips will run without too many pauses for uploading, etc.

And finally, the use of the technical support services of consultants based in another country, as was done in order to fix problems with the ISDB's IT infrastructure and to redesign their website and re-install or repair the Moodle platform, is not a long-term sustainable solution. Local technical support must be found and, for the ongoing maintenance of the online courses, the ISDB must have its own in-house expertise. Course administrators have been appointed and they did receive some training. However, much time has passed without the opportunity to practice and also the system has undergone some changes since then, so there will be a need to provide further training for the course administrators before the courses enter into full scale use.

Integration of Project Planning and Execution at Micro and Macro Levels

Thirdly, some attention must be given to the "macro-system" in which the proposed online courses will be embedded. We have already mentioned that some of the problems that were encountered in the training and development of the course design/development team were at least in part the result of some conflicts existing between the ISDB's internal goals and the in-house "micro" requirements of implementing "Certificado A" via Moodle, and the "macro" level goals and expectations of the government and funding agencies involved, who hope that the project will enable other teacher training institutions to implement the programme by a variety of alternative delivery modes.

This conflict of interests has resulted in the ISDB not managing to meet its originally planned schedule for course implementation and launch. On the other hand, the "macro level" ministerial organs who are promoting the project and awaiting its results are also the ones who are going to identify the participants, promote their enrolment and provide the necessary funding incentives. Apparently this process has not yet taken place, so if the ISDB had by chance succeeded in meeting its original planned course design/development schedule, it would now be in the position of having a course ready to run, but nobody ready to enrol. There is therefore a clear need for more careful and more systemic overall project planning and management which involves key decision makers and implementers at all levels of the nation's TVET system.

(This project has external support in part from Mozambique's Ministry of Education and in part from the Commonwealth of Learning (COL) through its "INVEST-Africa" initiative.)

References

Franque, A.D, (2008). Country Report to Advocacy workshop on Distance Education and Open Learning. Mauritius, April 11 – 12, 2008

Litto, F.M. (2004). Training and Capacity Building in Distance Education in Mozambique. Evaluation Report for the Period 24 April – 5 May 2004. Commonwealth of Learning, Vancouver, and South African Institute of Distance Education, Johannesburg.

Ministry of Education and Minstry of Higher Education, Science and Technology (2001). Educação à Distância em Moçambique. Ministério da Educação; Ministério do Ensino Superior,Ciência e Tecnologia. Maputo, Mozambique.
Ministry of Education and Culture (2005). Plano Estratégico de Educação e Cultura (2006-2011), Ministério de Educação e Cultura, Maputo, Mozambique.
Neeleman, Wim and Arnaldo Nhavoto. (2003). "Educação à Distância em Moçambique." RBAAD-Brazilian Review of Open & Distance Learning. 2:2, pp. 1-7. http://www.abed.org.br/publique/cgi/cgilua.exe/sys/start.htm
Romiszowski, A (2001). Higher Education in Mozambique: planning the distance education component. Report to the World Bank, Washington, DC.
Romiszowski, A. (2014-June). Instructional Design and Course Materials Development in Moodle for the Distance TVET Teacher Training Programme of the Dom Bosco Higher Institute, Mozambique. Mission Report. Commonwealth of Learning, Vancouver, BC.
Romiszowski, A. (2014-December). Elearning capacity building support at the Dom Bosco Higher Institute in Mozambique. Mission Report. Commonwealth of Learning,Vancouver, BC.

THE EFFECT OF USING MULTIMEDIA CASES ON PROSPECTIVE TEACHERS SELF-EFFICACY BELIEF

Peter Rugano
Syracuse University
prnthiga@syr.edu

Nicholas Twoli
Kenyatta University
nicholastwoli@yahoo.com

Michael Waititu
Kenyatta University
waititumichael@yahoo.com

The study explores how the use of multimedia cases affects the science teaching self-efficacy of prospective teachers in one university in Kenya. Chemistry and physics prospective teachers (N = 42) explored questioning and lesson introduction strategies using multimedia cases filmed in Kenyan classrooms. The changes in their self-efficacy was analyzed by looking at the difference in their scores in a pre-test and a post-test on a popular science teaching efficacy beliefs instrument developed by Enochs and Riggs, (1990). The results show that the use of multimedia cases created a cognitive dissonance that led to a decrease in the personal science teaching efficacy (PSTE) and no significant change on the science teaching outcome expectancy (STOE). These findings point to the effectiveness of multimedia cases in challenging the beliefs of prospective teachers during the methods courses.

Keywords: Self-efficacy, Multimedia Cases, Prospective Teachers, Sub-Saharan Teacher Education Programs

Background

The year 2015 marks the expiration of the timeline set for achieving Education For All (EFA), the Millennium Development Goals (MDG) and the onset of fresh agendas for development and education (Winthrop, Anderson & Cruzalegui, 2014). According to Winthrop et al., many educational stakeholders have called for a reformulation of the spirit of EFA agenda from merely access, to access *plus* learning. This fresh approach places more emphasis on the teacher's actions in class. Many studies have established that the teacher is the most influential factor in students' learning (Boonen, van Damme, & Onghena, 2014; Bressoux & Bianco, 2004; Darling-Hammond, 2006), and educators are looking to teacher education programs to improve the quality of learning.

Africa, with 54 countries, is the second largest continent and second most populous after Asia (World Atlas, 2014). The population of the region is rapidly growing at a rate of 2.4%, and in 2010, 43% of the population was under the age of 15 (UNESCO, 2010). This rapid growth places an enormous strain on resources, both financial and human that has negated the efforts aimed at uplifting the quality of education in the region (Mohamedbhai, 2008). Despite the acknowledgement of the central role of education in uplifting the individual and societal standards (Akindutire & Ekundayo, 2012), the inevitable large class sizes have been apportioned the largest piece of the blame for the deterioration in the quality of graduates, especially in teacher education programs within SSA (Indoshi, 2003; Kafu, 2011).

Kenya for example has experienced an unprecedented demand for higher education including in teacher education programs. In higher education, there were 570 undergraduate students and three graduate students in Kenya's only university at independence in 1963. By 2000, there were 50,000 undergraduate students and 5,000 graduate students enrolled in six universities (Gudo, Olel & Oanda, 2011). In 2014, about 325,000 students were enrolled in over 40 universities (see Figure 1). In 2014 alone, enrollment at the universities rose by about 35%.

The first teacher education program in Kenya began in 1964 at the University of Nairobi's constituent college called Kenyatta College (Kafu, 2011). The first professional teaching degree (Bachelors of Education) in Kenya was offered starting in 1970. To date, there are 22 public universities, 17 chartered universities, 12 universities with Letters of

Interim Authority (LIA), and two registered private universities. In all these, there are over 40 approved academic programs that train teachers and offer a bachelors certification (Commission of University Education (CUE), 2014).

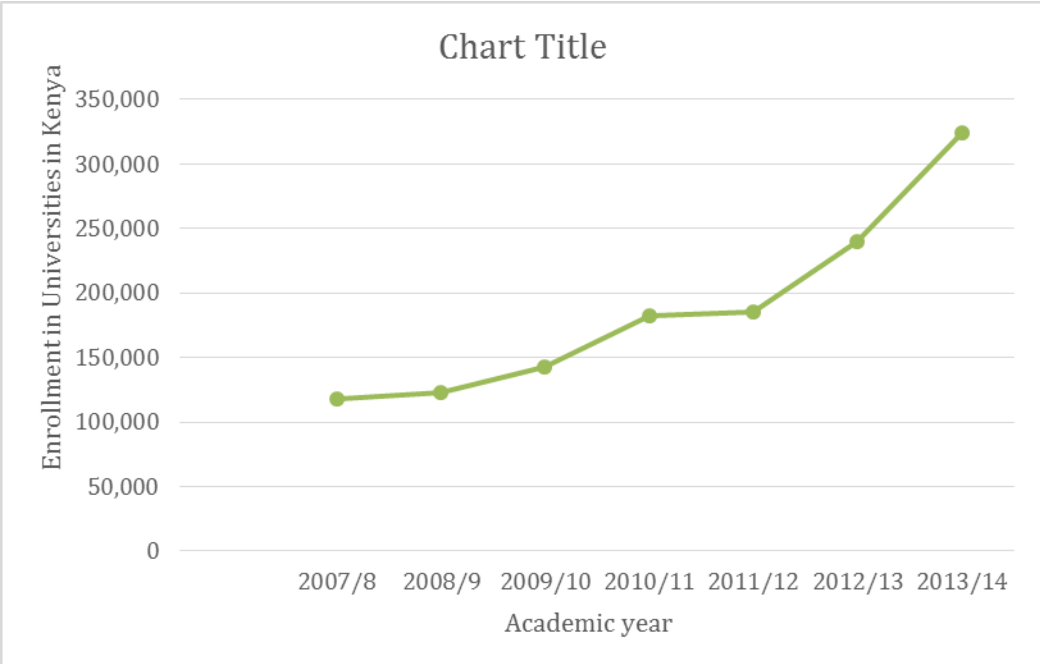


Figure 1: Enrollment in Kenyan Universities between 2007/8 and 2013/14 (Kenya Bureau of Statistics, 2014)

Though there are guidelines for the requirements for each degrees offered in the university, there is no regulatory professional body that monitors the standards of teachers graduating from the teacher education programs. This has implications for the quality of teaching, the nature of teacher education curricula, as well as the present image of the teaching profession in the country (Kafu, 2011). Kafu further noted that the status of facilities and resources used in these programs is not adequate for the skill levels desired of the graduating teachers. Beginning teachers in Kenya experience challenges fitting into the classroom, and they mainly blame this on their teacher preparation program (Indoshi, 2003).

Studies that focus on teacher education attribute the low quality of teachers graduating from these programs to the predominantly lecture–based instructional practices, examination oriented teaching culture, obsession with paper qualifications (Hardman et al. 2012), a very theoretical curriculum, and the inadequate supervision of practical field practice by the teacher educators (Akyeampong, Lussier, Pryor & Westbrook, 2013). It seems therefore, that pedagogical skills are studied for examinations and not for application. This has the effect of creating a large gap between theory taught in methods courses and actual classroom practice.

Challenge of Assessing Prospective Teacher’s Cognition

Shulman (1986) isolated a particular type of knowledge - pedagogical content knowledge - that teachers need to have for them to effectively teach domain specific content to their learners in ways that are appropriate to the students’ level. According to Shulman, pedagogical content knowledge (PCK) is knowledge, “which goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching” (p. 9). The main focus of teacher education programs is therefore to support prospective teachers in developing this knowledge that, alongside the knowledge of content, teachers need to have to be effective in their practice.

The notion of pedagogical content knowledge has undergone a significant re-evaluation. For example, Grossman (1990), linked PCK to the specific context of the learners; Magnusson, Krajcik, and Borko, (1999) argued that besides the context, PCK incorporates the dynamic process through which the subject, context and assessment of learning interact during classroom teaching; while Davis (2004) added that PCK evolves during the day-to-day experiences developed during interaction with the learners. Perhaps even more significant is the argument by Park and Oliver (2008), that PCK is developed through reflective practices, which also shape teachers' beliefs about teaching and learning. In teacher education programs that lack integrated field experiences, such as the case for teacher education programs in SSA, it becomes challenging to determine what kind of cognition, other than examination grades, would be most suitable to reflect effectiveness of prospective teachers.

While the teacher training programs focus on acquisition of this specialized knowledge, some scholars have argued that teachers' knowledge is "perspective-bound and belief-generated" (Tillema, 1995, p. 292) and what is more vital is the belief change that is likely to alter the perspectives and orientations of prospective teachers. Kagan (1992) described such beliefs as "tacit, often unconsciously held assumptions about students, classrooms, and the academic material to be taught" (p. 65). Beliefs encompass both attitudes and subjective norms. This makes it difficult to disentangle teachers' cognitive knowledge from teachers' individual preferences and opinions on how things need to be (Ewijk & van der Werf, 2012). This implies that teachers can gain new knowledge in their methods classes, but still remain greatly influenced by their beliefs, especially when deciding whether they accept the new knowledge and apply it.

Bandura (1977) stated that beliefs are the best indicators of the decisions that individuals make in everyday life, better than knowledge and motivation. He argued that knowledge alone could not account for the behaviors that are observed in human beings. Teacher education scholars have placed teachers' belief system at the center of understanding teachers' actions in their classrooms (Nespor, 1987; Pajeras, 1992). More specifically, the study of teachers' self-efficacy beliefs has gained recognition as an outcome of teacher education (Bandura, 1986). Gibson and Dembo (1984) argued that there are important behavioral differences between teachers who have different levels of self-efficacy beliefs and therefore posited that the understanding of beliefs is critical to teacher education programs. Other studies on teachers' beliefs and teachers' knowledge concur with the assertion that teachers' beliefs are stronger predictors of behavior than teachers' knowledge (Ewijk & van der Werf, 2012; Kagan, 1992).

Beliefs that teachers hold are formed even before they embark on their teacher training. Shilling-Traina and Stylianides (2013) gave examples of teachers' beliefs that are prevalent in teacher trainees and that influence the behavior of teachers, irrespective of the knowledge they have about student learning. When prospective teachers believe that the efforts of students are not very important in their success, they will not use students centered approaches but rather stick to teacher centered approaches. Another example is when prospective teachers believe that teaching well depends on making school work interesting, they will reject as irrelevant parts of their methods course that focus on teaching students to use metacognitive strategies. The most prevalent belief about teaching involves the use of the traditional lecturing approach as a primary vehicle for communicating a teacher's enthusiasm for subject matter. Such beliefs may lead prospective teachers to react negatively to ideas for cooperative learning.

Prospective teachers bring with them to teacher education these beliefs about the nature of teaching and learning. These beliefs then interact with the content and pedagogy of their teacher education courses to influence what and how they learn (Anderson & Bird, 1995). The beliefs that teachers bring to teacher education programs are quite resistant to change. Ewijk and van der Werf (2012) argued that it is only when teacher beliefs are proven unsatisfactory when challenged that the individuals will be motivated to change them. The main mechanism for change in beliefs is the creation of cognitive conflict – a cognitive dissonance that challenges the emotional quality of the held beliefs and provides new information that can be integrated into the individual's belief system to either modify existing beliefs, replace held beliefs with new ones, or develop alternative parallel beliefs (Shilling-Traina & Stylianides, 2013).

Nespor (1987) argued that beliefs draw their strength from previous episodes and events that illuminate the current events, more than from cognitive knowledge. This view complicates the endeavors of teaching pedagogical content knowledge using lecture and examination methods, such as the ones prevalent in large classes within SSA. Such classes provide few opportunities for analyzing new teaching episodes and reflecting on them. However, the promise of determining appropriate beliefs about teaching lies in a subset of beliefs about an individual's self-judgment of their own abilities to execute behaviors that have desirable outcomes. Bandura (1977) defined this subset of beliefs as self efficacy – the belief that one has the power to produce an effect by completing a task or activity related to that competency. Self-efficacy encompasses two constructs that are independent of each other: personal teaching efficacy and outcome expectancy (Bleicher, 2004; Riggs & Enoch, 1990).

Changes in self-efficacy beliefs have been reported to originate from school-based experiences. For example Knoblauch and Hoy (2008) and Onen and Kaygisiz (2013) reported that the self-efficacy beliefs of science teachers increased after doing their first teaching practicum. The gain in self-efficacy beliefs was not so high when the prospective teachers went for their field placement in more challenging schools. Caprara, Barbaranelli, Steca and Malone (2006), attributed changes in self-efficacy to a higher level of job satisfaction among teachers and also to student achievement. Self-efficacy is also greatly influenced by contextual factors, such as the teaching resources available to the teachers, as well as interpersonal support available (Tanel, 2013; Tschannen-Moran & Hoy, 2007). These findings have a strong bearing on teacher training environments that have teachers with low morale, lacking adequate resources, and without well organized support mechanisms for prospective teachers' initial field practice.

Multimedia Cases

Research on the use of multimedia cases (MMCs) with prospective teachers has shown promising gains in equipping novices with skills to meet the demands of 21st century classrooms. Various studies have discussed how the use of cases has shaped the epistemological evolution of professional knowledge and skills as well as the beliefs of professionals. For example, MMCs have been reported to cause cognitive dissonance that is prerequisite for conceptual change and attitude modification (Fitgerald, 2011; Koury et al., 2009; Pfister, White & Masingila, 2006), lead to acquisition of knowledge and skills (Malesela, 2009; Thomas & Reid, 2011), as wells as scaffolding the debut classroom teaching (Fulei, 2010; Masingila & Doerr, 2002). Other studies reported an increased transfer of theory to practice (Bencze, 2009; Firtgerald, 2011; Masingila, Ochanji & Pfister, 2010).

Prospective teachers' initial teaching experience can be scaffolded through the use of MMCs (Fulei, 2010). Conducting initial teaching practice by injecting prospective teachers straight into schools where they experience teaching and learning contexts is comparable to teaching people how to swim by throwing them into the deep end of a swimming pool. The study by Fulei (2010) postulated that, in such a case, the prospective teachers, in order to survive, adapt to traditional perspectives and practices – mainly teaching the way they were themselves taught. Fulei suggested that prospective teachers could learn how to teach by first observing practicing teachers through a MMC, a safe environment that will allow for observations, reflections and discussions of teaching practices.

One of the best ways to make the practice visible to novice teachers is through exposure to field experiences (Darling-Hammond, 2006). Limited resources may problematize collaboration with school classrooms as sites for investigation. But the representations and approximations of classroom practices can be brought into methods courses through videos recorded lessons. Such lessons can then be prepared as multimedia cases and used as sites for examining and reflecting on teaching practices. The challenge, therefore, is to provide empirical evidence that the use of multimedia cases would be a more effective way to stir the self-efficacy of prospective teachers.

Design of Study

Prospective teachers from Central University's physics and chemistry subject methods classes were invited to participate in the study and were asked to fill a pre-test questionnaire. The questionnaire was adopted from the Science Teaching Efficacy beliefs instrument developed by Riggs and Enoch (1990) and scores science teaching efficacy on a 5-point Likert scale that requires participants to respond if they strongly agree, agree, undecided, disagree or strongly disagree with 23 items. The respondents were then asked to attend a session that used multimedia cases to discuss one subtopic in their methods course and then complete a post-test of the same questionnaire.

The chemistry prospective teachers were taken through a 2-hour session discussing questioning strategies in classroom. They were shown four 3 to 5 - minutes video segments that were selected to highlight different questioning strategies that the veteran video teachers used in their classes. The video segments featured questions that progressed from low-order recall questions to complex questioning strategies that required the video case students to recognize patterns and extend their thinking to respond to a question that was beyond what the teacher had discussed.

The physics prospective teachers were taken through two sessions that focused on ways to conduct a good lesson introduction, and the other focused on conducting a teacher demonstration. The segments highlighted both exemplars of practice and not so good practices.

In both cases, the discussion was structured using the concept of Learning to Notice that emphasizes the ability of teachers to notice the rapidly changing and unpredictable interactions in classroom teaching. The Learning to Notice Framework (van Es & Sherin, 2002) has been used in structuring feedback from teachers in video lesson analysis. In this study the modified framework required that teachers watch a video segment and *describe* what they have seen. Describing involved identifying what is important or noteworthy about a classroom situation and making a "call out" (van Es & Sherin, 2002, p. 573). They then watched it again and *evaluated* the segment. This means they reach to their affective domain to make value judgments. Watching a second time also fills up the gaps in their initial description and its not uncommon for teachers to notice and describe in more details incidences that they did not notice in the first viewing. The final part of the framework requires teachers to *interpret* what they have noticed by connecting the classroom interactions to the broader principles of teaching and learning that they have learned from their methods courses.

The number of participants in the MMCs was unexpectedly larger than would be suitable for effective class discussion. For example, one physics session had approximately 120 students in attendance and another chemistry session had approximately 100 students. So, a worksheet was designed to have each students individually respond to the task of *describing, evaluating* and *interpreting* the video segments. The pre-test and post-test questionnaires were matched, together with the worksheets. A total of 42 (*N=42*) matched and completed responses formed the data that was analyzed to answer the research question: What is the effect of using MMCs on prospective teachers self-efficacy beliefs?

Analysis of Self-efficacy Beliefs

The science teaching efficacy beliefs instrument (STEBI) measures two constructs: personal science teaching efficacy (PSTE) and science teaching outcome expectancy (STOE). PSTE is a person's belief in his or her ability to teach science effectively and STOE is the belief that the persons teaching approach will have a positive effect on student learning outcomes. PSTE and STOE are independent of each other. Of the 23 items on the STEB instrument, 13 items measure PSTE and the other 10 items measure STOE.

To determine the changes in personal teaching efficacy for the prospective teachers, the responses were analyzed as follows: The responses from the negatively worded items were first recoded into positive statements. The highest positive response of "strongly agree" was assigned a value of 5 points, while the lowest response "strongly disagree" was awarded 1 point. These points were then tallied for each of the items that measure the two constructs separately. The sum of pre-test scores was then subtracted from the sum of the posttest scores for the chemistry and physics group of students. A paired t-test analysis of the changes on both constructs was then done. To get a clearer picture of the change across the participants a graph of the changes from pretest to posttest for constructs was drawn.

Results

Prospective teachers hold high, false-positive, personal teaching efficacy beliefs. They belief that they are able to teach very effectively but when they are exposed to the intricate classroom interactions through analysis of multimedia cases, their beliefs are challenged and they do not feel as confident about their personal ability to teach. Prospective teachers also belief that the way they would teach would yield high student outcomes. This belief is not significantly affected after watching MMCs during a methods course.

The maximum personal efficacy score that a participant can get on the 13-item PSTE questionnaire is 65. The average pre-test score for the physics and chemistry prospective teachers were 57.5 and 59.0 respectfully. These scores are quite high and comparable well with scores in other studies. It means that the prospective teachers strongly agreed with items that asked them about their personal efficacy in teaching science. When they prospective teachers were taken through multimedia case studies, the scores decreased to 33.5 and 34.5 for the chemistry and physics prospective teachers. This implies that the MMCs had the effect of challenging the personal teaching efficacy beliefs, evidence of a cognitive dissonance, which proceeds belief modification.

A closer look at the pattern in the changes in PSTE scores revealed that all the participants without exception scored lower in the post-test than in the pretest. To make this clearer, a graph of the ascending scores on pretest (PSTE) and corresponding score on the post- test (PSTE_P) for each participant was created using an Excel spreadsheet (See Figure 2).

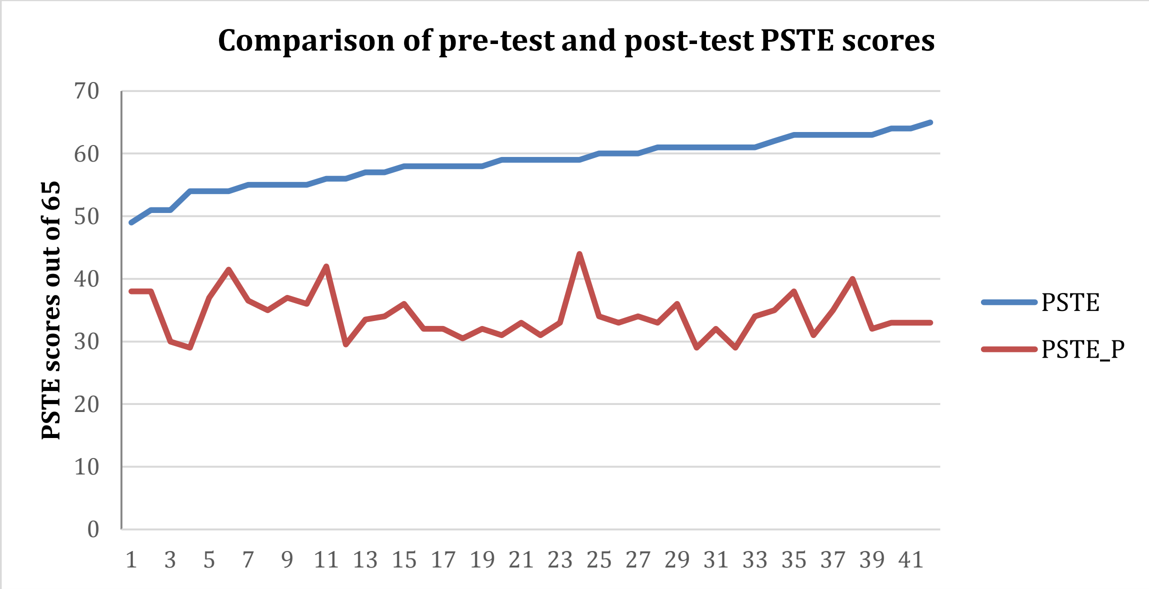


Figure 2: Comparison of PSTE Scores

An analysis of the science teaching outcome expectancy (STOE) was done by adding up the scores on the other 10-items on the science teaching efficacy instrument. These items measure the belief that what prospective teaches belief about teaching will have positive outcomes with the students. The results show that the teachers hold high outcome expectancy beliefs. These beliefs are unchallenged or altered by using multimedia cases in the methods courses. The mean outcome expectancy scores for the physics and chemistry prospective teachers at pre-test are 41.5 and 39.5 respectfully out of a possible maximum score of 50. After the intervention the scores were 41.5 for physics group and 38.9 for the chemistry group.

The paired T-tests for both physics and chemistry groups shows that there is a statistically significant difference in the change in PSTE scores of prospective teachers who used MMCs in their methods course (N = 42, M = -24.39, SD = 5.71 p = .000). This means that the teacher's personal beliefs that they are able to teach their subjects effectively decrease significantly when they use MMCs. The prospective teacher's belief that the way they teach will have a positive effect on the students' learning is not significantly affected by the use of MMCs in the methods courses (N = 42, M = -0.21, SD = 4.32, p = .750) (see Table 1). This means that using MMCs does not significantly change the way prospective teachers feel about the impact of their teaching strategies on students learning outcomes.

		Paired Differences					t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Pair 1	$PSTE_{(post)}$ – $PSTE_{(pre)}$	-24.392	5.71	.88107	-26.17222	-22.61350	-27.685	.000
Pair 2	$STOE_{(post)}$ - $STOE_{(pre)}$	-.214	4.32	.66742	-1.56217	1.13360	-.321	.750

Table 1: Paired t-tests for changes in scores for PSTE and STOE

Analysis of Prospective Teachers' Worksheets

To make more sense of these findings, a further analysis was done on the worksheets that the prospective teachers used during the multimedia case study lessons. The chemistry group was shown four questions that progressed from low-order poorly posed question (What is matter?), to high order question that required students in the video lesson to recognize patterns in writing chemical symbols and suggest what the chemical symbol for bromine would be. We will discuss the pattern that was consistent across most of the worksheets using one example of a video segment in the chemistry group.

In the first segment, the video teacher introduced the topic for the day as "constituents of matter" and then put up a slide that reads matter is a substance that occupies space and has mass. He then looked at it as if to read the slide, a gesture that intuitively directed student's attention to what is written on the slide. He turned to the students and said, " we all have come across the word "matter," can anyone tell us what is matter? Hands up?" At this point numerous hands went up and he then looked at the students for about 30 seconds, apparently trying to select and nominate one of them to give a response. He finally pointed to one student and said, "yes". The student said that matter is anything that occupies space and has mass. The teacher said, "correct" and repeated the response, "matter is anything that occupies space and has what?" Then all students respond in chorus "mass."

A survey of most of the worksheets shows that the descriptions written indicated that the prospective teachers noticed the teacher's actions, the student's reaction, as well as the classroom environment. For example, one prospective teacher wrote:

> The teacher introduced the sub-topic "constituents of matter" very well and gave the various classifications of substances in real life. He then introduced the classification of matter in terms of chemistry. After that the teacher poses a question " what is matter" and the students raises up their hands where he nominates one student. (Overwritten on the initial description), The teacher also repeats the definition. The definition was already on the board (slide). There is biology on the board (referring to writing still on the board from the previous lesson). (Chemistry worksheet, 2015)

A number of the evaluative remarks ranked this question as average and good. The rationale given included the fact that being at the beginning of the lesson, the teacher needed to ask easy recall questions, establish students prior knowledge and the need to start from known to unknown. Evaluations on the worksheet that said the question was not good cited the low cognitive demand, the presence of a visible answer while the question is being posed, selecting students from the front desks, and the inaudible low volume of the student while responding.

During the plenary discussion prospective teachers attention was focused to the factual ways of knowing matter that the question and the responses may have missed to capture. The discussion centered on whether students looking at a bottle half-filled with water would be able to identify the bottle, the water inside as well as the air above the water surface as matter, based on their presumed knowledge of what matter is. This new focus led the prospective teachers to challenge the way students knew "matter". One prospective teacher suggested, " the best way is to ask what is not matter" (Field observation notes, 2015). This implies that it would be better to think of anything other than a vacuum as matter as a way as a sure way of debunking a common student misconception that air does not occupy space. Before going to the next question, it appeared like the prospective teachers were in agreement that the way a question is posed determines the cognitive engagement of the students, and that poorly posed questions do not challenge student's ways of understanding and leads to lower forms of learning (for example the rote memorization of a definition) at the expense of deeper conceptual understanding of chemistry.

Though the other video segments contained higher order questions, the evaluation and rationale given seemed to be more critical of the exact wording of the questions, the failure to consider alternative ways of seeking deeper understanding, the inadequate time allowed for thinking, the failure to extend students thinking from an incorrect response, and later in the final segments, the inability of the teacher to reach the students at the back of the class.

The physics lessons followed a similar pattern: the first clip was evaluated very positively but after a plenary critique of the teacher actions and overall effect on the learning objectives the subsequent clips were criticized for failing to elicit students prior conceptions, failing to anchor the lesson on students everyday knowledge, and setting or not setting an appropriate climate for the days lesson.

The opportunity to observe lessons, think about the teacher actions and critique with peers such actions in a non intimidating environment may have led most of the prospective teachers to reach the conclusion that teaching may not be as easy as they initially thought, hence the lower personal teaching efficacy scores at the post-test.

Discussion

Prospective teachers have perceptions of teaching and learning that are based on their schooling experiences and are hardly affected by the theoretical nature of methods courses that they take in their teacher education programs. Based on such experiences, prospective teachers hold high self-efficacy beliefs about teaching. They feel confident that they know how to teach, and that their way of knowing will yield good learning outcomes.

Using multimedia cases in such methods classes highlights the importance of teacher actions in advancing students learning. Knowledge and skills about teaching and learning are understood in a way that is practical and that creates a cognitive conflict that challenges the held beliefs leading to attitude and behavior modification (Shilling-Traina & Stylianides, 2013; Pfister, White & Masingila, 2006). For prospective teachers who have no field experience, and therefore have not had any chance to evaluate students' learning, the belief change may not affect how they feel about student's outcomes. The resulting cognitive dissonance serves as a reality check on the held beliefs.

Limitations for the Study

The intervention that was done with the participants was very brief, and it would be important to see if there would be an increase in self-efficacy after a sustained use of multimedia cases in the methods courses. The brevity of the intervention also limited the reinforcement of the learned concepts through mastery experiences, such as would be achieved by asking participants to model exemplar practices.

References

Anderson, L. M., & Bird, T. (1995). How three prospective teachers construed three cases of teaching. *Teaching and Teacher Education*, *11*(5), 479-499.

Bandura. A**.** (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*, 191-215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*, 248-287.

Bencze, L., Hewitt, J., & Pedretti, E. (2009). Personalizing and contextualizing multimedia case methods in university-based teacher education: An important modification for promoting technological design in school science. *Research in Science Education, 39*, 93-109.

Bleicher, R. E. (2004). Revisiting the STEBI‐B: Measuring self‐efficacy in pre-service elementary teachers. *School Science and Mathematics*, *104*(8), 383-391.

Bressoux, P., & Bianco, M. (2004). Long‐term teacher effects on pupils' learning gains. *Oxford Review of Education*, *30*(3), 327-345.

Boonen, T., Van Damme, J., & Onghena, P. (2014). Teacher effects on student achievement in first grade: Which aspects matter most? *School Effectiveness and School Improvement*, *25*(1), 126-152.

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology*, *44*(6), 473-490.

Cannings, T. R., & Talley, S. (2002). Multimedia and online video case studies for pre-service teacher preparation. In D. Watson et al., (Eds.). *Networking the Learner* (pp. 699-710). NY: Springer Science.

Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs*. San Francisco, CA: Jossey-Bass.

Davis, B. (2004). *Inventions of teaching: A genealogy*. Routledge. Retrieved from https://books.google.com/books?hl=en&lr=&id=cquRAgAAQBAJ&oi=fnd&pg=PP1&dq=davis,+2004+teachers+beliefs&ots=JtZ7UaP0Hs&sig=5KyCC2S0dRBqouvx6g5JUpDoz5c#v=onepage&q&f=false.

Enochs, L., & Riggs, I. (1990). Further development of an elementary science teaching efficacy belief instrument: A pre-service elementary scale. *School Science and Mathematics*, *90*, 694–706.

Ewijk, C., & van der Werf, G. (2012). What teachers think about self-regulated learning: Investigating teacher beliefs and teacher behavior of enhancing students' self-regulation. *Education Research International*, *2012*, 1-10.

Fitzgerald, G., Mitchem, K., Hollingsead, C., Miller, K., Koury, K., & Tsai, H. (2011). Exploring the bridge from multimedia case studies to classrooms: Evidence of transfer. *Journal of Special Education Technology, 26*(2), 23-38.

Fulei Z. (2010). Multimedia case methods in university-based teacher education and learning. *Second International Conference on Multimedia and Information Technology (MMIT), 2*, 345-348.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569.

Grossman, P. L. (1990). *The making of a teacher: Teacher knowledge and teacher education.* New York, NY: Teachers College Press.

Gudo, C. O., Olel, M. A., & Oanda, I. O. (2011). University expansion in Kenya and issues of quality education: Challenges and opportunities. *International Journal of Business and Social Science*, *2*(20), 203-214.

Hardman, F., Ackers, J., Abrishamian, N., & O'Sullivan, M. (2011). Developing a systemic approach to teacher education in sub-Saharan Africa: emerging lessons from Kenya, Tanzania and Uganda. *Journal of Comparative and International Education*, *41*(5), 669-683.

Harfitt, G. J. (2012). An examination of teachers' perceptions and practice when teaching large and reduced-size classes: Do teachers really teach them in the same way? *Teaching and Teacher Education, 28*(1), 132-140.

Hourigan, K. L. (2013). Increasing student engagement in large classes: The ARC model of Application, Response, and Collaboration. *Teaching Sociology, 41*(4), 353-359.

Indire, F. (1982) Education in Kenya. In Fafunwa A.B. & Aisiku J.U. (Eds.) *Education in Africa: A comparative survey* (pp 115-139). London, UK: G. Allen & Unwin.

Indoshi, F. C. (2003). Teachers' experiences of the probation period of teaching in Kenya: Implications for teacher induction policies and programmes. *Journal of In-Service Education*, *29*(3), 473-488.

Kafu, P. A. (2011). Teacher education in Kenya: Emerging issues. *International Journal of Curriculum and Instruction*, *1*(1), 43-52.

Kagan, D.M. (1992). Implications of research on teacher belief. *Educational Psychologist, (27)*1 65–90.

Knoblauch, D., & Hoy, A. W. (2008). "Maybe I can teach those kids." The influence of contextual factors on student teachers' efficacy beliefs. *Teaching and Teacher Education*, *24*(1), 166-179.

Koury, K., Hollingsead, C., Fitzgerald, G., Miller, K., Mitchem, K., Tsai, H., & Zha, S. (2009). Case-based instruction in different delivery contexts: The impact of time in cases. *Journal of Interactive Learning Research*, *20*(4), 445-467.

Levin, B. B. (1995). Using the case method in teacher education: The role of discussion and experience in teachers' thinking about cases. *Teacher and Teacher Education, 11*(1), 63-70.

Magnusson, S., Krajcik, J., & Borko, H. (1999). Nature, sources, and development of pedagogical content knowledge for science teaching. In J. Gess-Newsom & N.G. Lederman (Eds.). *Examining pedagogical content knowledge* (pp. 95-132). Dordrecht, Netherlands: Springer.

Malesela, J. M. (2009). Case study as a learning opportunity among nursing students in a university. *Health SA Gesondheid, 14*(1), 1-6.

Masingila, J. O., & Doerr, H. M. (2002). Understanding pre-service teachers' emerging practices through their analyses of a multimedia case study of practice. *Journal of Mathematics Teacher Education, 5*, 235-263.

Masingila, J.O., Ochanji, M. & Pfister, C. (2004). Learning from the process: The making of a multimedia case study. *Contemporary Issues in Technology and Teacher Education, 4*(3), 269-283.

McFadden, J., Ellis, J., Anwar, T., & Roehrig, G. (2014). Beginning science teachers' use of a digital video annotation tool to promote reflective practices. *Journal of Science Education and Technology*, *23*(3), 458-470.

McNergney, R. E., & Herbert, J. M. Ford, RE (1994). Cooperation and competition in case-based teacher education. *Journal of Teacher Education*, *45*(5), 339-345.

Mohamedbhai, G. (2008). *The effects of massification on higher education in Africa*. Report from the Working Group on Higher Education of the Association for the Development of Education in Africa. Retrieved from http://www2.aau.org/wghe/scm/meetings/mai08/adea/study_massification.pdf.

Mugenda, O. M. & Mwangi, I. (2014) Governance of public universities in Kenya: A scholar-practitioners perspective. In F. M. Mafukho, H. M. A. Muyia, & B. J. Irby (Eds.), *Governance and transformations of universities* (pp. 43-60). Charlotte, NC: Information Age Publishing Inc.

Nemirovsky, R., DiMattia, C., Ribeiro, B., & Lara-Meloy, T. (2005). Talking about teaching episodes. *Journal of Mathematics Teacher Education*, *8*(5), 363-392.

Nespor, J. (1987). The role of beliefs in the practice of teaching. *Journal of Curriculum Studies*, *19*(4), 317-328.

Önen, F., & Kaygisiz, G. M. (2013). Prospective science teachers' self-efficacy beliefs about teaching science between 6–8 terms and the opinions on these beliefs. *Educational Sciences: Theory & Practice*, *13*(4), 2449-2453.

O'Sullivan, M. C. (2006). Teaching large classes: The international evidence and a discussion of some good practice in Ugandan primary schools. *International Journal of Educational Development*, *26*(1), 24-37.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *(62*), 307–332.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, *66*, 543-578.

Pajeras (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from: http://www.uky.edu/~eushe2/Pajares/eff.html.

Park, S., & Oliver, J. S. (2008). Revisiting the conceptualization of pedagogical content knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. *Research in Science Education*, *38*(3), 261-284.

Pfister, C. C., White, D. L., & Masingila, J. O. (2006). Using multimedia case studies to advance pre-service teacher knowing. *International Education Journal*, *7*(7), 948-956.

Pryor, J., Akyeampong, K., Westbrook, J., & Lussier, K. (2012). Rethinking teacher preparation and professional development in Africa: An analysis of the curriculum of teacher education in the teaching of early reading and mathematics. *Curriculum Journal*, *23*(4), 409-502.

Ramey-Gassert, L., & Shroyer, M. G. (1992). Enhancing science teaching self-efficacy in preservice elementary teachers. *Journal of Elementary Science Education*, *4*(1), 26-34.

Sherin, M. G., & Han, S. Y. (2004). Teacher learning in the context of a video club. *Teaching and Teacher Education*, *20*(2), 163-183.

Shilling-Traina, L. N., & Stylianides, G. J. (2013). Impacting prospective teachers' beliefs about mathematics. *ZDM Mathematics Education 45*(3), 393-407.

Shulman L. (1992). Toward a pedagogy of cases. In J.H. Shulman (Ed.), *Case methods in teacher education* (pp. 1-30). New York, NY: Teachers College Press.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational researcher*, *(15)*2 4-14.

Sifuna, D. N. (1980). *Short essays on education in Kenya.* Nairobi, Kenya: University of Nairobi Press.

Sifuna, D. N. (1992) Diversifying the secondary school curriculum: The African experience. *International Review of Education 38*(1), 5-18.

Smolleck, L. A., & Morgan, A. M. (2011). Changes in pre-service teachers' self-efficacy: From science methods to student teaching. *Journal of Educational and Developmental Psychology 1*(1), 133- 145.

Stockero, S. L., & Van Zoest, L. R. (2013). Characterizing pivotal teaching moments in beginning mathematics teachers' practice. *Journal of Mathematics Teacher Education*, *16*(2), 125-147.

Stuart, J., K. Akyeampong, & A. Croft (2009). *Issues in teacher education: A sourcebook for teacher educators*. London, UK: Macmillan.

Swackhamer, L. E., Koellner, K., Basile, C., & Kimbrough, D. (2009). Increasing the self-efficacy of in-service teachers through content knowledge. *Teacher Education Quarterly*, 63-78.

Takahashi, S. (2011). Co-constructing efficacy: A "communities of practice" perspective on teachers' efficacy beliefs. *Teaching and Teacher Education*,*27*(4), 732-741.

Thomas, C.N., & Reith, H. J. (2011). A research synthesis of the literature on multimedia anchored instruction in pre-service teacher education. *Journal of Special Education Technology*, *26*(2), 1-22.

Tillema, H. H. (1995). Changing the professional knowledge and beliefs of teachers: A training study. *Learning and Instruction*, *5*(4), 291-318.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: It's meaning and measure. *Review of Educational Research*, *68*(2), 202-248.

UNESCO (2010). *Review of recent sector studies and preparation of a sector study data base. Operational analysis and sector analysis division*, Bureau for Coordination of Operational Activities UNESCO. Paris, France: Author.

van Es, E. A., & Sherin, M. G. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, *24*(2), 244-276.

van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, *10*(4), 571-596.

Westbrook, J., Durrani, N., Brown, R., Orr, D., Pryor, J., Boddy, J., & Salvi, F. (2013). Pedagogy, curriculum, teaching practices and teacher education in developing countries. Department for International Development (DFID), Retrieved from http://r4d.dfid.gov.uk/Output/195891/.

Winthrop, R., Anderson, K., & Cruzalegui, I. (2014). A review of policy debates around learning in the post-2015 education and development agenda. *International Journal of Educational Development*, *40*, 297–307.

World Atlas (2014). A guide to Africa. Retrieved from http://www.worldatlas.com/webimage/countrys/af.htm.

CHEMISTRY PROFESSORS' CONCEPTION OF NATURE OF SCIENCE: IMPLICATION FOR SCIENCE EDUCATION

Fredrick Ssempala
Syracuse University
fssempal@syr.edu

John W. Tillotson
Syracuse University
jwtillot@syr.edu

One of the goals of science education is to improve the scientific literacy among the population. This is normally done through the education system of any country. Classroom science teachers are at the fore front of this goal, and hence a lot of research to assess and improve the nature of science (NOS) conception of pre-service and in-service teachers has been done especially in developed countries like United States for the last 64 years (since 1950). However, science teacher training in colleges/ Universities involves faculty members in education departments (mainly teaching method courses to pre-service courses) and those in science departments (teaching mainly content courses to pre-service science teachers). Little research has been done to explore NOS conceptions of the science faculty members moreover these members implicitly or explicitly may influence the way pre-service teachers conceive and teach about and/ with the NOS after they graduate from the teacher training colleges/ universities. Hence the purpose of this study was to explore the Chemistry professors' conceptions of the NOS in the private research University located in North Eastern part of United States. Four chemistry professors were interviewed and their classes were observed by the researcher. This paper describes how the chemistry professors' conceive nature of science, and the factors which have influenced their conception of NOS views. The implication for science teacher education is discussed accordingly.
Key words: Chemistry Professors, Nature of Science, Science Education

Introduction

One of the goals of science education is to bring up scientifically literate individual, and in turn, developing a scientifically literate society (American Association for Advancement of Science [AAAS], 1990, 1993; Miller & Osborne, 1998). A scientifically literate person knows not only the major concepts, hypothesis, and theories of science, and usage of scientific concepts, process skills, and values, in making every day decisions, but has an understanding of nature of science(NOS) (Matthews, 1994).

In the last two decades, NOS has been included as a critical component of scientific literacy (Lederman, 1992). Despite the fact that science education community disagree on s specific definition for NOS (Abd-El-Khalick, 2005), *it is acceptable that NOS refers to the epistemology of science, science as a way of knowing, or the value and beliefs inherent to the development of scientific knowledge (Lederman, 1992).* McComas, Clough, and Almazroa (1998) point out that NOS is a mult-dimensional concept by giving a broader and more specific description of NOS including aspects related to history, sociology, psychology, and the philosophy of science. Considered in this context, it is clear that science comprises not only facts, definitions, concepts, theories, and laws, but also the attributions of scientific investigations, the properties of scientific knowledge, the beliefs, attitudes, and qualifications of scientists, the processes scientists utilized through scientific inquiry, the interaction between science and society/ culture in which it is practiced, and so on (Bayir, Cakici & Ertas, 2013). These characteristics represent the core aspects of NOS which are the main focus of this study. Most science researchers, science educators, and science organizations have agreed on some aspects of NOS (AAAS, 1993; Abd-El-Khalick & Lederman, 2000; Lederman, Abd-El-Khalick, McComas, 1998). These aspects describe the qualification of science and scientific knowledge.

The value of improving individuals understanding of NOS for societies is debated in terms of arguments which represent **economic, utilitarian, democratic, cultural**, and **moral reasons (**Driver, Leach, Miller, & Scott, 1996). In this regard, the importance of achieving sound understanding of NOS is strongly emphasized in major science education reforms documents (AAAS, 1993), in USA and in other countries such as Canada, UK, Denmark, Spain and Turkey (Matthews, 1998). These considerations about NOS recently turned science educators' and researchers' attention towards exploring views about aspects of NOS. To date, a great deal of research has explored both students' and teachers' (pre-service and in-service) views of NOS (Abd-El-Khalick, 2006; Abd-El-Khalick & Boujaunde, 1997; Abd-El-Khalick & Lederman, 2003; Budak & Koseoglu, 2008; Cakici & Bayir, 2012; Kang, Scharmann, & Noh, 2005; Lederman, 1992; Parker, Krockover, Lasher, Trapp, & Eichinger, 2008; Pomeroy, 1995; Rayan & Aikenhead, 1992; Walker & Zeidler, 2007). On the other hand, there is little research which explored conception of scientists about NOS in literature (Behnke, 1961; Kimball, 1967-1968, Pomeroy, 1993; Samarapungavan, Westby, Budner, 2006; Schwartz & Lederman, 2008; Wong & Hodson, 2009). Given that science professors (scientists) generally they teach at university and conduct scientific research which latter produce scientific knowledge (content) taught in elementary school, high school and colleges, it is very reasonable to express that science professors play a major role in developing of society, bringing up both other scientists and science educators (elementary and high school teachers, and science education instructors in teacher training colleges), who have duties in society and essentially shaping the future of societies. In other words, science professors (scientists) at the university, play a central role in training elementary and high school teachers in domains such as chemistry, physics, biology, and earth sciences by participating in teaching content courses as well as writing content textbooks used at elementary school , high school and education faculties/colleges. As such they play a very important role to improve the scientific literacy in the society. It is therefore very valuable to understand how science professors conceive NOS. This is because the way science professor conceive NOS may influence the way the teach content to pre-service teachers and hence affect their conception either implicitly positively or negatively. It is against this background that this study was done to contribute to the literature within neglected important area primarily to explore the Chemistry professors' conception of NOS, since chemistry is one of the major science subjects in high school.

Literature Review

The literature review is organized into two sections; the first section is on the research about views of students and science teachers (pre-service and in-service) on NOS, and the second section is on the views of scientists on NOS.

Views of Students and Science Teachers (pre-service and in-service) on the NOS

Over the past 64 years (since 1950), students' and teachers' views has been the focus of intensive research (Bayir & Ertas, 2014). Many of studies relating to the pre-service and practicing science teachers' views put forward that teachers held naïve views about several important aspects of NOS (Abd-El-Khalick & Boujaoude, 1997; Abd-El-Khalick & Lederman, 2000; Aguirie et al., 1990; Lederman, 1992; Pomeroy, 1993). Aguirie et al. (1990) found that teachers view science as a body of knowledge that has been 'proven' to be correct. Similarly, Abd-El-Khalick and Boujaoude (1997), and Lederman (1992) reported that the majority of teachers held the views that, a universal scientific method exists and scientists follow it in their investigations. It is also indicated that teachers ignore the role of creativity and imagination in scientific investigation. In addition, the teachers referred to a hierarchical relationship between theories and laws, where by theories became laws with new supporting evidence (Abd-El-Khalick & Boujaoude, 1997). A significant proportion of teachers also did not believe that scientific knowledge is subject to change (Lederman, 1992). Many teachers possess positivistic, idealistic views of science (Lederman, 1992; Pomeroy, 1993). The question is, where, how, from who and when do these teachers develop these positivistic views of NOS? What could be the contextual factors in our education system, which facilitates the science teachers' development and retention of the positivistic views of NOS?

Similarly, much research repeatedly indicated that students' (from elementary school to university levels), views of science typically were not in line with the contemporary views about NOS (Abd-El-Khalick, 2006; Bell et al. 2003, Cakici & Bayir, 2012; Kang et al., 2005; Parker et al, 2008;Ryan & Aikenhead, 1992; Walker & Zeidler, 2007). Kang et al. (2005) reported that students held absolutist/ empiricist views about NOS. According to Parker et al. (2008), students did not recognize that scientific theories and laws constitute two distinct types of knowledge and have no hierarchical relationship. Also Cakici and Bayir (2012) found that none of the children in their sample held informed views of scientific method before engagement with role-play activities. The tentativeness of scientific knowledge and the role of creativity in science are NOS aspects which students seem to have inadequate knowledge (Abd-El-Khalick, 2006; Bell et al., 2003). It is evident that most science educators agree that majority of students and science teachers hold naïve views which are not consistent with the contemporary concepts of the NOS. Considering the fact that the student today are the tomorrow's scientists, then at what point do these student drop the naïve views of NOS and develop the contemporary views of NOS, or do they continue to stick on the their positivist views when they become scientists? This study tries to answer the above question specifically about the chemistry professors (scientists).

Views of Scientists on NOS

Although there is large body of research attempting to find out the views of students and teachers about NOS, considerable less attention has been directed at the issue of exploring the views of scientists (Behnke, 1961; Karakas, 2011; Kimball, 1967-68; Pomeroy, 1993; Samarapungavan et al., 2006, Schwartz & Lederman, 2008; Wong & Hodson, 2009). The results of the past research, which were mostly executed by comparing scientists' views of NOS with those of teachers, have indicated that scientists have diverse views about NOS and they do not necessarily possess contemporary views about it. Behnke (1961) found out that, 20% of the scientists held the view that improving lives and solving everyday problems were the goals of scientific enterprises. On the other hand, more than 50% of the science teachers had this view. Based on these findings, Behnke concluded that both of the groups possessed some naïve views on NOS. Kimball (1967-1968), explored differences between practicing scientists' and teachers' understanding of NOS. These studies found that there was no significant difference in terms of the understanding of NOS between the two groups. Pomeroy (1993) explored NOS beliefs of scientists (natural and social scientists), secondary school teachers, and elementary school teachers. Pomeroy's findings showed that, the views of scientists were more traditional than teachers.

Samarapungavan et al. (2006) investigated how research chemists and chemistry students conceptualized and evaluated their work. They found that the participants' beliefs of science varied with chemistry expertise and with exposure to authentic research. According to Samarapungavan et al. (2006), differences in both the duration and the nature of participation in research had a significant effect on how participants conceptualized science and scientific research.

Schwartz and Lederman (2008), examined practicing scientists' views of NOS and explored possible relationships between these views and science context. They found that views of NOS are not necessarily related to science contexts. The results indicated that the scientists in their study did not hold all informed or all naïve notions. Their conception related to NOS varied widely between the two. Wong and Hodson (2009), ascertained to reveal the prominent features of NOS embedded in authentic scientific inquiry with 13 scientists from different parts of the world. Their results indicated that a somewhat striking contrast exist between the scientists' descriptions of their research and practices within the science, and the image of science usually depicted in science curricula and textbooks.

Karakas (2011) investigated how college science faculty in United States who teach introductory level integrated science courses including the field of chemistry, biology, physics and earth sciences, understand and define science, and nature of science (NOS). He found out that, the science faculty held sophisticated and complex conception of NOS. In some instances, their views were more mixed and naïve. He therefore concluded that engaging in scientific inquiry is not enough to ensure informed conceptions of NOS (Karakas, 2011).

From the above reviewed literature, it is visible that most studies reported that students, science teachers (pre-service and in-service) and scientists do not generally possess the required NOS conceptions. However most of the research done about scientists was not discipline specific. Hence there was a need to explore the conception of NOS of scientists in specific discipline. That is why this study was done to explore the chemistry professors' conception of NOS in order to contribute to the literature how chemistry professors view NOS. The chemistry professor were selected because they are key stakeholders in generating the content taught in elementary and high school, as well as in training of pre-service chemistry teacher in colleges. I choose chemistry because of my background as a chemistry high school teacher and also I hold a Master degree in science education (majoring in chemistry). Hence it was possible for me to probe the chemistry professors during the interviews on some chemical examples they gave to justify their conceptions of NOS

Purpose of the Study

The purpose of this study was to explore the Chemistry professors' conceptions of the NOS in the private research University located in North Eastern part of United States.

Research Questions

The study was guided by the following research questions.

1. How do Chemistry professors conceive NOS?
2. Is the conception of NOS by Chemistry professors in agreement with contemporary views of NOS?
3. What factors have influenced the Chemistry professors; conception of NOS views?

Methods

Participant Identification and Selection

In this study, Purposive and convenient sampling procedures were used for selection of the four chemistry professors who participated in the study(Fraenkel & Wallen, 2000). In the first stage, I identified the chemistry professors in chemistry department who were involved in teaching undergraduate and post-graduate chemistry courses, through the chemistry department administrator and chair of chemistry department. This was because we wanted to interview and also observe the chemistry professors in their classroom as they were teaching. After obtaining the list of the professors, they were contacted via emails by explaining the purpose of research and hence requesting them to participate. The professors who expressed interest and were willing to participant in the study were physically contacted for interviews and also their lessons were observed. Some professors had interest, but they were too busy to have time for interviews and were left out. I tried to make sure we balance the participants to include at least one professor from each of the three main chemistry branches (Physical, organic and inorganic). However, at University level most of the fields are inter-disciplinary by nature, for example out of the 24 chemistry professors in the department, 14 were in organic/biochemistry, 8 in physical chemistry and only 2 in inorganic chemistry related research.

The main criteria for selection of participants included possession of a doctoral degree, being involved in teaching undergraduate & post-graduate courses, being involved in research and having at least assistant professor status.

Data Generation

I employed qualitative methods, and particularly the interviews and classroom observation aspect of ethnographic research design in collecting data. Ethnographic design, as Creswell (2008) describes them, “are qualitative research procedures for describing, analyzing, and interpreting a culture-sharing group’s shared pattern of behavior, beliefs, and language that develop over time,” (p.481). Thus, by using in-depth interviews and observation in this study, I explored the “culture-sharing behavior, beliefs, and language among the chemistry professors’ views emerge. The in-depth/open-ended nature of interviews, as Bogdan and Biklen (2007) write, “allows the subjects to answer from their own frame of reference rather than from one structured by prearranged questions”(p.3). I also used loosely structured interview guide to elicit the views of chemistry professors about the NOS and a Framework for K-12 Science Education (NRC, 2012). The seven questions in the interview formed by grounding in views of nature of science questionnaires, scientist version (VNOS-Sci) (Schwartz & Lederman, 2008): (a) meaning of science; (b) a universal scientific method which involves sequential steps exist or not; (c) social and cultural embedded of scientific knowledge; (d) the relationship between scientific theory and laws; (e) imagination and creativity in scientific knowledge; (f) theory-laden/subjectivity of scientific knowledge and (g) tentativeness of scientific knowledge (scientific theories and laws).

Lederman (1992) stressed the importance of using individualized interviews to produce accurate representation of respondents’ NOS views. During the interviews, all the participants pronounced their actual views about the seven target aspect of NOS and a Framework for K-12 Science Education (NRC, 2012). All the interviews were audio-taped and ranged between 40-60 minutes for each professor. The interviews were then transcribed immediately after the interviews into text for further analysis. The classroom observation data was also typed into word document for further analysis. Both the interview and observation field notes were peer reviewed to improve their quality before analysis was done.

Data Analysis

I converted the field notes generated audio interviews and classroom observations into word documents for qualitative data analysis using open coding (Lichtman, 2013). By qualitative data analysis, I mean a process of systematic searching and arranging the interview transcripts, field noes, and other materials to come up with findings (Bogdam & Biklen, 2007; Saldana, 2013). Taylor and Bogdan (1998) asserted that data analysis is an ongoing process that involves coding data, developing description and themes from data, connecting the related themes, understanding the data in-context, and reporting findings. I coded the text data to identify themes using Creswell (2008) criteria of coding data, which involves identifying code words from the text data, then grouping similar codes and looking for redundant codes with intention of reducing the codes to a smaller more manageable number. Using this refined list, I went back to the data to find if there were any emerging codes, and then reduced codes to common themes supported by evidence. I also went on to write several analytical memos during the process of data analysis particularly reflecting on; how I relate personally with my participants in the study, emerging patterns, emerging and existing themes(Saldna, 2013). These analytical memos helped me to finally write my findings after reading and summarizing them. Finally, I come up with eight broad themes which are reported below in my findings.

Findings

The findings of the study are arranged under the following eight themes:

Meaning of Science

All the four Chemistry professors interviewed generally conceived science as the study of natural world by means of experiments. They also claimed that scientists rely on scientific method to generate the scientific knowledge, which is different from other types of knowledge in field like social sciences. However at a certain point, some professors admitted that scientific knowledge cannot be one hundred percent objective (is not absolute Truth). But they were making this admission reluctantly compared when they making the claim that science is objective than social science. When it came to the question whether science give us absolute 'Truth', their voice could be seen lowering down, implying they did not want to admit that scientific knowledge is also tentative like any other type of knowledge in social science disciplines. Also, they were emphasizing experiments to be part and parcel of science. For example professor Clement said that," We only study science with our five senses. In case of things we cannot see, we normally use the instruments which allow us to make observation with the senses we have. Science is always based on reality."

For professor Derik asserted that, "Science is a search for objective 'Truth'. Science study things which are not subjective. Not everything in the worlds is objective."

Generally the professors' conception of NOS in this case, was partly in agreement with the contemporary view of NOS, were scientific knowledge is considered to be based on and/ or derived from observation of natural world. However, it is not true that all scientific knowledge rely on experiments. Some scientific knowledge like in case of Astronomy is generated though theoretical models by scientists, and cannot be experimented in the real world.

During the lesson observations, the professors were seen teaching the content as if it is absolute 'Truth'. They were presenting the chemistry content in the authoritative manner. This kind of instruction implied that the professor indeed conceived science as absolute 'Truth'!

Comparison of Science and Social Sciences

All the four professors interviewed conceived Science as a superior knowledge to Social sciences. They gave reasons such as; science involves experiments and hence scientists are more objectives when conducting their research than social scientists that just depend on theories and people's perceptions to make generalizations. They also argued that, scientific studies can be replicated and obtain the similar results, whereas social science studies cannot be replicated and obtain the similar results. They gave a number of justifications to prove their point that indeed scientific knowledge is more valid and reliable than social sciences. They were implying that science is clean and objective and hence free from human biases/ subjectivity compared to social sciences like history, psychology, Anthropology, philosophy and many others, which are influenced by the human biases/ subjectivity. For example professors Derik said that:

> Right, first of all, science is based on something we sense with our five senses. That is to say something that is not happening just in our thought or brain. We try in science to describe the way nature works. We apply some mathematical rules in explaining how nature works and also to predict future events. So, that makes science different from religion and philosophy, which usually based on more mystique thoughts and fantasy. (Derik)

However on further probing, some professors admitted that some scientists may be influenced by their personal biases/subjectivity during scientific investigation and hence producing subjective findings accordingly. For example professors Gabriel said that:

> I think culture influences the generation of scientific knowledge in one way on the other. Also since scientists are human beings, their social values will definitely affect the way they carry out their research. That is why you cannot have 100% objective science. Many

> times our subjectivity tends to influence the way we interprets our observations accordingly. It is a fact that all human beings are subjective. But the training we get as scientist help us to control our subjectivity to a minimum level; however you cannot take your subjectivity to 0.0%. If you can have 0.0% subjectivity then you will be like a machine. (Gabriel)

Generally all the four professors conceived science as a superior knowledge to social science because they think science is more objective and can be tested by experiments unlike social sciences which just depend on theories.

In this case, the professors' conception was totally not in agreement with the contemporary view of NOS. According to the contemporary view if NOS, scientific knowledge is influenced by human subjectivity. That is, the development of questions, investigations and interpretation of data are filtered through the lens of current theory. This is an unavoidable subjectivity that allows science to progress and remain consistent, yet also contribute to the change in science when previous evidence is examined from the perspectives of new knowledge. Personal subjectivity is also unavoidable. Personal values, agendas, and prior experiences dictate what and how scientists conduct their work.

During the classroom observations, it was vividly noticed that the professors were presenting the chemistry content as a sanitized 'Truth' to the learners. There was no point in time where the professors showed the students the limitation of the concepts they were giving them. The professors did not even relate the chemistry concepts to the social life of students in the lesson. This type of teaching proved that the professors conceive science as a superior knowledge to social science and hence should be taught authoritatively.

Relationship between Scientific Theories and Laws

All the four professors interviewed believed that scientific laws are more valid than the scientific theories. Hence their conception of the relationship between laws and theories were contrary to the contemporary view of NOS. According to the contemporary view of NOS, scientific theories and laws are different kind of scientific knowledge. Laws describe relationships, observed or perceived of phenomena in nature. Theories are inferred explanations for natural phenomena and mechanism for the relationship among natural phenomena. Hypothesis in science may lead to either theories or laws with accumulation of substantial supporting evidence and acceptance in the scientific community. Theories and laws do not progress into one and another, in the hierarchical sense, for they are distinctly and functionally different types of knowledge. Hence it was unfortunate to find out that all the professor conceived scientific laws to be superior than theories, which is the same conception is found in most of science teachers in elementary and high school (Abd-El-Khalick,2006; Bell et al. 2003; Cakici & Bayir, 2012). For example professor Derick when asked whether scientific theories become laws with more evidence, he asserted that," Yes with more evidence the scientific theory becomes a law". Meanwhile when professor Clement was asked, which of the two is more advanced, he asserted that:

> Off course the law is more advanced. That is why there are only five laws of nature. And all what we want to know about science comes from laws. The laws of science we have discovered on this earth are the only ones in the universe. Hence science produces 100% absolute 'Truth'. For example ten years ago we sent a rocket ship to travel billions of miles away from the earth basing on Newton's laws of motion and chemical thermodynamics laws. If there were anything different from our understanding of laws of physics and chemistry, none of these would have happened. (Clement)

During classroom observation, it was evident that the professors the way they were giving the students the scientific laws, indicted that the laws are absolute in nature. The professors did not tell students the limitation of the laws.

Creativity and Imagination in Science

The chemistry professors accepted that indeed creativity and imagination are part of science. However, one of the professors was of the view that, it is only experienced scientist who can afford to be creative because even if they make the mistake in the process, they are likely to be forgiven by their colleagues. He argued that the novice scientist always follow the scientific method so that their work can be accepted for publication. This is the case because the scientific community will reject the scientist's findings if his/her findings cannot be replicated by other scientists under the same conditions. It is because of this kind of restriction that most scientists cannot risk being creative, which is, thinking outside the box. Here is what the professor Gabriel said:

> Well I could say that the best scientists use creativity and imagination more than the scientific method. But most novice scientists tend to get stuck with the scientific method. That is why we have few scientists who invent new things. In reality majority of scientist always follow the scientific method mainly because it is very difficult to publish your work if your method is not clear to your fellow scientists. Your colleagues should be able to follow the same method and get similar results, failure to do so, then it stop to be science but magic or superstition. [ON: Laughs]. Essentially the moment a scientist deviate from the scientific method in most cases is isolated by the fellow scientists. That is why most of us we continue to follow the scientific method, much as we are aware that sometimes a person need to think outside the box in order to come up with new innovation. But it is quite risky not to follow the scientific method. (Gabriel)

On the other hand professor Clement was of the view that all scientists use creativity and imagination in their everyday experiments. He argued that any progress in science is due to the creativity of scientists. Hence, he was convinced that without creativity and imagination we cannot have any progress in science. Here is what the professor Clement said:

> *RES:* is there creativity and imagination during scientific investigations?
> *Clement:* Yes, scientists use creativity and imagination. We cannot have any progress in science if scientists were not creative. In order to innovate something you have to be creative
> *RES*: Is it possible to follow the scientific method and also be creative?
> *Clement:* Sometimes the scientific method is very rigid and hence it may not be possible to have creativity when you follow the scientific method. However not all scientific discoveries are made through the scientific method. Senior scientists use a lot of creativity more than the novice scientists. It is not easy to be innovative if you think within the box. However after a discovery, a very scientist is required to outline the duplicable scientific method for others to verify his / her claim. If the process cannot be duplicable, then that is not science. In other word even if you make a scientific discovery by chance, you are required to work back word and come up with a scientific method acceptable by other scientists in your field of study.

Generally the professors conceived science to be a mixture of scientific method, and creativity and imagination. In this case, the professors had contradictory view because if you follow the scientific method, you cannot at the same time afford to be creative. That is to say, you cannot have your cake and at the same time eat it.

According to the contemporary view of the NOS, scientific knowledge is created from human imagination and logical reasoning. This creation is based on observations and inferences of the natural world. The contemporary view of NOS considers the scientific method a myth which misleads learners about the NOS. All scientific discoveries are a product of creativity/ imagination of great scientists. After the discovery other scientist may design experiment to verify the products and latter design the bigger processes for industrial production. The scientific method may be used to improve the product which was already discovered. It is easier to improve the already discovered product than discovering the new product. That is why very few scientists are able to discover any product in their life time.

Influence of Science by Culture/Society Values

All the four chemistry professors believed that sometimes science is influenced by culture/ society values especially the type of research to be conducted at particular time. This is mainly done by allocating funds to the areas a particular society consider to be vital and limiting funding to those areas the society consider not relevant. In this case one area of science may grow at very high rate whereas another area just gets stagnated. However they did not believe that culture/ society values influence the quality/validity of knowledge produced by research. They argued that scientific finding are always objective, except in situation where the scientists who is involved in research is dishonest. For example professors Clement said that:

> Culture generally will not influence science directly, but will influence the nature of scientific investigations the scientists decide to undertake. For example the Ebola virus has been around for the last 30 years, but since it was not infecting people in western world, there was no interest to find the vaccine for the Ebola. But now that it is becoming a global threat, scientists in western world are going to do research to get the vaccine. Also people in Liberia were thinking that Ebola is caused by witch craft. This has real affected the success of prevention of Ebola spread in this country. Many health workers have also died in the process. Hence culture may drive science in one-way or another. (Clement)

Meanwhile when Professor Derik was asked whether he think culture influences science? He asserted that, “Absolutely yes, it also influences what is science about. People do research on what they think is important to their society or what is connected to their culture / values in one way or the other.” Professor Michael also emphasized that:

> Culture definitely influences science. It determines what thing people consider as important and what research is funded. However our current scientific enterprise tries to make sure that the outcomes of scientific research are not really biased by the culture of a given society or funders of research. (Michael)

In this case the professors’ views were also contradicting each other. They claimed at one point that the scientific knowledge is not influenced by culture/society values, and on the other they argued that some dishonest scientists may adjust their findings to fit the interest of the funders of research. Since the funders are part of society, hence it implies that even scientific knowledge is influenced by the culture/society values accordingly. Hence indirectly the professors were admitting that science is indeed influenced by culture/society values. But they were not willing to admit this fact openly because it could place science at the same level with social science. This makes science lose its special position accordingly.

According to the contemporary views of NOS, science is a human endeavor, and as such, is influenced by the society and culture in which it is practiced. The values and expectations of culture determine what and how science is conducted, interpreted and accepted. That is why Galileo was imprisoned by the Catholic Church when he claimed that the earth is not the Centre of the universe and that the earth is just one of the planets which rotate around the sun. By then, the Catholic Church was the authority in the knowledge. That is why to date the whole world still using the annual calendar which was made by one of the Catholic pope. But Pope John Paul (RIP) apologized on behalf of the Catholic Church in the 20th century to have imprisoned Galileo for saying the truth. Therefore it is very difficult to avoid the influence of science by culture/society values.

Relationship between Observation and Inferences in Science

The three out of four professors interviewed believed that scientists make objective observations during the scientific experiments and use their theories to interpret their observations. They claimed that, the interpretation in science may differ depending on the theoretical base of scientist concerned. Thus this may be the cause of disagreement among scientists. For example professors Clement said, “We normally make observation with our senses, but we interpret using our theories. Hence since scientists may have different theories, there is likely to have different interpretation of nature.” Whereas Professor Derik disagreed with his colleagues when he asserted that, “yes what we see is subjective, but we have designed a bunch of rules to differentiate the subjective observation and objective observation. One of such rules is the scientific method which demands that the observation should be replicable by your colleagues.”

The three professors’ (Clement, Gabriel and Michael), conception of observation as objective is contrary to the contemporary view of NOS. According to the contemporary view of NOS, science is based on both observation and inferences. Observations are gathered through human senses or extension of those senses (for example microscope), perspectives of current science and the scientists guide both observation and inferences. Multiple perspectives contribute to valid multiple interpretation of observation. As such the professors conceiving observation as neutral or objective was not in agreement with the contemporary view of NOS. However the professors’ conception of theory to guide inferences in science was in line with the contemporary view of NOS.

Chemistry Professor’s Views on a *Framework for K-12 Science*

The professors had contradictory views about a Framework for the K-12 Science. For example, Derik at first denied knowledge about the K-12 Science core curriculum, but after I explained to him what the framework was all about, he then said that, “they should teach more science concepts in K-12, which will later help learners to become engineers instead of integrating engineering practices in K12 science.” On the other hand Professor Michael was positive about integrating engineering practices in k12 science because it helps learners to appreciate the application of science in solving real problem in society.

> I think they are probably very helpful. I have a nephew who is now 16, he is actually on the robotics team and this really inspired him to learn more about science again because engineering is one way of being creative also. It is not the same as the creativity of science but it is a little bit easier for students to get some opportunity to be creative and to use the knowledge base that, part of what we want students to learn when they learn science is the knowledge base. (Michael)

For Clement and Gabriel, they said that they have no idea of what the framework is about. When informed them that, the frame work emphasize teaching science in an integrated way and mixing science and engineering practices, they said that they have no problem with the idea, but were concerned about the teachers’ competence to implement the core k12 core curriculum.

Factors that have Influenced Chemistry Professors’ Conception of NOS Views

Generally all the professors said that their conception of NOS is the product of their elementary, high school and college/ University science education. Except Gabriel who did a course in philosophy of science during his graduate program which greatly shaped his conception of NOS. For example Derik was the view that all people are born scientist, but they do not develop their scientific potential due to some contextual factors. Derick asserted that:

> I was born a scientist, from the very beginning. The voice you hear is the same voice when I was a child many years ago. I think all people are born scientists but they never practice science because they find themselves embedded in family and things that are for human existence. And those things color what they think are important. For me I knew when I was a teenager that I will never understand people. Science, energy and Math are objective and understandable. But we will never understand a person. People will always be a mystery to human beings. *(Derik*)

Michael was the view that his childhood experience played a big role for him to become a chemist. For example Michael emphasized that:

> I was influenced by my childhood experience especially when I watched a film and observed how oil floating on water was burning. At first I thought it was water burning at my 5-year age, but my father told me that it was oil burning because it floats on water. Since then, I picked interest in chemistry to date. (Michael)

This implies that much as these professors have been involved in research at University level, their foundation was built by elementary, high school teachers and their college science instructors. Hence in-service elementary and high school teachers have great role they play to shape the conception of NOS, which in turn affect the way pre-service teachers are trained, it is a vicious cycle.

Discussion of Findings

The findings of this study show that generally the chemistry professors’ conception of nature of science in some aspects is in agreement and in other aspects it is not in agreement with the contemporary views of NOS. For example the four professors believed that scientists apply creativity and imagination when conducting scientific investigations, and also that culture/society values influence science in one way or the other. But some professors added that science does not influence the outcome of the scientific research because of the scientific rules which minimize the influence of personal interest to affect the outcome of research. These findings agrees with Schwartz and Lederman (2008), who found out that the conception of practicing scientists to NOS varied widely between all informed or all naïve notion. Most of chemistry professors’ conceptions of NOS were more of positivist than post-modernist in nature. This finding is in agreement with Pomeroy (1993), who found out that the views of scientists were traditional than teachers.

Considering the fact that these chemistry professors have been practicing science for long time, but still held some positivist/ traditional views of NOS, for instance believing that, “scientific theories mature into laws with more evidence”, then this is in agreement with Karakas (2011), conclusion that, engaging in scientific inquiry is not enough to ensure informed conception of NOS. However this finding disagree with Samarapungavan et al. (2006) who found out that, research chemists and chemistry students difference in NOS conception varied with both the duration and nature of participation in research.

Generally the findings from this study indicate that the chemistry professors’ conceptions of NOS are almost similar to that found in science teachers (Bayir & Ertas, 2014; Lederman, 1992; Pomeroy, 1993). This is in similar with Kimball (1967-1968), who found out that there was no significant difference in terms of understanding of NOS between practicing scientists and science teachers. This finding indicates that science educator needs to intensify the continuous explicit approach to help learners develop the required NOS conceptions.

Conclusion

The Chemistry professor conception of Nature of science can be classified into three categories. That is, the **Positivist, Post-modernist and the sophisticated** categories.

The **positivists** a Chemistry professor conceives scientific knowledge as absolute "Truth" and hence believe that science is the product of scientific method and scientists are objective when conducting scientific experiments. These professors think that culture does not influence the production of scientific knowledge and hence we have a universal scientific knowledge. The conception of NOS of the positivist Chemistry professors is generally in disagreement with most of contemporary views of the NOS. These professors are more likely to teach science in authoritative way (using traditional methods of instruction) and if they write the text books they are likely to emphasize the scientific facts and scientific method other than the role of creativity and imagination in scientific investigation.

The **Post-modernist** Chemistry professors on the other had conceived science to be tentative "truth" and hence are a product of human creativity and imagination, and are also influence by human subjectivity/culture/values. These professors think that scientific observation and inferences cannot be objective because they are guided by existing theory. Hence as the theories changes, also the observations and inferences are likely to change. These professors think that there is no difference between science and social sciences. Their conception of NOS is basically in agreement with most of contemporary views of NOS. These professors are more likely to teach science using constructivist approaches like inquiry and discussions (leaner centered)

The third category is the one with **Sophisticated** views of NOS. These Chemistry professors have mixed (contradictory) view of NOS. They had both the Positivists and Post-modernists views of NOS. At one point they had views which agree with the contemporary and on further probing they could contradict their own view, that is why in literature are referred to as sophisticated views of NOS by Bayir, Cakici and Ertas (2014).

All in all the chemistry professors interviewed conceived science generally in a positivist way. This greatly influences how the Chemistry content is presented in text books and taught in classroom at High school and college.

Recommendations

Science Faculty members are key stakeholders in Science education of any country. They have always been actively involved in reforming science education (NRC, 2012). Hence there is a need the faculty members in science education departments to share their research on science pedagogy with their colleagues in science departments in order to improve the teaching-learning of science at elementary school, high school and college level. Many times researchers tend to focus on pre-service and in-service science teachers and take it for granted that scientists are automatically scientifically literate.

There is need to conduct more research to explore the conception of science professors in fields like botany, zoology, physics, and earth sciences to contribute to the body of knowledge of how science professors conceive science, and also the contextual factor which influences their NOS conceptions. "We will not meet the needs for more and better higher education until professors become designers of learning experiences and not teachers. (Larry Spence, 2001)"

Limitation of the Study

The findings of this study are limited by the few professors who were interviewed and also they were basically from a developed country (USA) and one University. May be if more professors were interviewed from different countries/ Universities you may get a different findings. In additions, all my participants were male in gender; hence these findings may not be generalized to female chemistry professors accordingly.

References

Abd-El-Khalick, F. (2005). Developing deeper understanding of nature of science. The impact of philosophy of science course on pre-service science teachers' views and instructional planning. *International Journal of Science Education*, 27 (1), 15- 42.

Abd-El-Khalick, F. (2006). Over and over again: college students' views of nature of science. In L., B., Flick & N., G., Lederman (Eds.), *scientific inquiry and nature of science* (pp389-425). Dordrecht. Springer.

Abd-El-Khalick, F., & Boujaoude, S. (1997). An exploratory study of the knowledge base for science teaching. *Journal of Research in Science Teaching*, 37(7), 673-699.

Abd-El-Khalick, F., & Lederman, N., G. (2000). Improving science teachers; conception of nature of science. Acritical review of the literature. *International Journal of Science Education*, 22 (7), 665-701.

Aguirre, J., M., Haggerty, S., M., & Linder, C., J. (1990). Student-teachers conception of science, teaching, and learning: A case study in pre-service science education. *International Journal of Science Education*, 12 (4), 381-390.

American Association for Advancement of Science. (1990). *Science for all Americans*. New York: Oxford University press.

American Association for Advancement of Science. (1993). *Benchmarks for science literacy*: A project 2016 report. New York Oxford University press.

Bayir, E., Cakici, Y., & Ertas, O. (2014). Exploring natural and social scientists views of the nature of science. *International Journal of Science Education*, 36 (8), 1286- 1312.

Behnke, F., L. (1961). Reactions of scientists and science teachers to statements bearing on certain aspects of science and science teaching. *School Science and Mathematics*, 61, 193-207.

Bell, R., L., Blair, L., M., Crawford, B., A., & Lederman, N., G. (2003). Just do it? Impact of science apprenticeship program of high-school students' understanding of nature of and scientific inquiry. *Journal of Research I Science Teaching*, 40 (3), 487-509.

Bogdam, R., C., & Biklen, S., K. (2007). *Qualitative research for education: An introduction to theories and methods* (5th ed.). Pearson Education Inc. Upper Saddler River, New Jersey, USA.

Budak, E., & Koseoglu, F. (2008). *Developing an explicit inquiry-based professional workshop. Examining effects on science teachers' views of science.* Proceedings of the XIII International Organization for Science and Technology Education (IOSTE) Symposium, Izmir.

Cakici, Y., & Bayir, E. (2012). Developing children's views of the nature of science through the role play? .*International Journal of Science Education*, 34 (7), 1075-1091.

Creswell, J., W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (*3rd ed.). Pearson Education Inc. Upper Saddler River, New Jersey, USA.

Driver, R., Leach, J., Miller, R., & Scott, P. (1996). *Young people's image of science*. Buckingham: Open University Press.

Fraenkel, J., R., & Wallen, N., E. (2000). *How to design and evaluate research in science education* (4th ed.). Boston: McGraw-Hill.

Kang, S., Sacharmann, L., c., & Noh, T. (2005). Examining students' views on nature of science: Results from Korean 6th , 8th , ad 10th graders. Science Education, 89, 314-334.

Karakas, M. (2011). Science instructors' views of science and nature of science. *The Qualitative Report*, 16 (4), 1124-1159.

Kimbal, M., E. (1967-1968). Understating the nature of science: A comparison of scientists and science teachers. *Journal of Research in Science Teaching*, 5 (2), 110-120.

Lederman, N. (1992). Students and teachers conception of the nature of science: A review of the research in Science Teaching. *Journal of Research in Science Teaching*, 29(4), 331-359.

Lederman, N., G. (1992). Students' and teachers' conceptions of the nature of science: A review of the research. *Journal of Research in Science Teaching*, 29(4), 331-359.

Lichtman, M. (2013). *Qualitative research in education: a user's guide* (3rd ed.). Los Angeles. Sage.

Matthews, M., R. (1994). *Science teaching: The role of history and philosophy of science*. New York: Routledge.

McComas, W., F., Clough, M., P., & Almazroa, H. (1998). The role and character of science. In McComas, W., F. (Ed.). *The nature of science in science education: Rationales and strategies* (pp.3-40). Dordrecht. Kluwer.

Parker, L., C., Krockover, G., H., Lasher-Trapp, S., & Eichinger, D., C. (2008). Ideas about the nature of science held by undergraduate atmospheric science students. *Bulletin of the American Metrological society,* 89, 1681-1688.

Pomeroy, D. (1993). Implication of teachers' beliefs about the nature of science: Comparison of beliefs of scientists, secondary science teachers and elementary teachers. *Science Education*, 77, 261-278.

Ryan, A., G., & Alkenhead, G., S. (1992). Students' perceptions about the epistemology of *science. Science Education*, 76, 559-580.

Saldana, J. (2013). *The coding manual for qualitative researchers*. Los Angeles. Sage.

Samarapungavan, A., Westby, E., L., & Bodner, G., M. (2006). Contextual epistemic development in science: A comparison of chemistry students and research chemists. *Science Education*, 90, 468-495.

Schwartz, R., S., & Lederman, N. (2002). "It's the nature of the beast." The influence of knowledge and intentions on learning and teaching nature of science. *Journal of Research in Science Teaching,* 39(3), 205-236.

Schwartz, R., S., & Lederman, N. (2008). What scientists say: Scientists' views of nature of science and relation to science content. *International Journal of Science Education*, 30 (6), 727-771.

Taylor, S., J., & Bogdam, R., C. (1998). *Introduction to qualitative research methods: A guide book and resources* (3rd ed.). New York. Wiley.

Walker, K., A., & Zeidler, D., L. (2007). Promoting discourse about socio-scientific issues through scaffolded inquiry. *International Journal of Science Education*, 29 (11), 1387-1410.

Wong, S., L., & Hodson, D. (2009). From the horse's mouth: What scientists say about scientific investigation and scientific knowledge. *Science Education*, 93 (1), 109-130.

ASSESSMENT AND IMPROVING SCIENCE TEACHERS' CONCEPTION OF NATURE OF SCIENCE (NOS): A REVIEW OF THE LITERATURE

Fredrick Ssempala
Syracuse University
fssempal@syr.edu

This paper is a review of literature on assessment of, and attempt to improve the nature of science (NOS) conception of science teachers for the last 64 years. Most of the researchers in the 20th century used the quantitative approach to assess NOS conception of science teachers. However recent researchers in this 21st century (last ten years) are using both the quantitative and qualitative approaches. There are basically two approaches used to improve the NOS of science teachers, that is 'implicit' and the 'explicit' approaches. Most researchers argue that explicit approach is more effective than implicit approach in improving NOS of science teachers. However recently some researchers are beginning to argue that, it is better to use both the implicit and explicit approaches concurrently in order to improve the NOS conception of science teachers.

Key words: Science teachers, Nature of Science, Assessment and improvement

Introduction

The ultimate goal of science education is scientific literacy for all students. Scientific literacy involves understanding not only scientific knowledge, but also understanding nature of science (NOS) - 'knowledge of both why science believe what it does and how science has come to think that way' (Duschl, 1988). If students are to become scientifically literate, in part through NOS, It stands to reason that their teachers must understand how science works, so that they can model appropriate behaviors and attitudes. Unfortunately, many science teachers misunderstand and misrepresent NOS (Khajornsak, 2010; Martin, Porlin & Rivero, 2011; Seuny. Bryan & Butter, 2009).

Hence there has been a concerted effort to assess and improve the teacher's conceptions of NOS so that they are able to teach with and about NOS in their lessons with the hope to improve the NOS of learners accordingly.

What is NOS?

The construct "nature of science" (NOS) has been advocated as an important goal for studying science for approximately more than 100 years (Central Association of Science and Mathematics Teachers, 1907). At a general level, understanding NOS is often defended as being a critical component of scientific literacy (National Science Teachers Association, 1982).

Before attempting to review the research on assessment and improving science teachers' conception of NOS, it is important to provide some general parameters for the meaning of NOS construct. What is NOS? It might help to back up to the proverbial question, what is science? The most common answer to this question in literature is: 1) body of knowledge, 2) method, and 3) way of knowing. NOS typically refer to the epistemology of science. Science as a way of knowing or the values and beliefs inherent to scientific knowledge and its development (Lederman, 1992).

Among the aspects of NOS that fall under this level of generality are that scientific knowledge is: tentative (subject to change), empirical (based on and/ or derived from observation of natural world), theory-laden, partly the product of human inference, imagination and creativity (involves the invention of concepts and explanations), socially and culturally embedded and function/ relationship between scientific laws and theories (National Research Council, 1996). In this regard, NOS aspects are not conceived of as disparate, but rather as integral components of an epistemology in which scientific knowledge is produced through critical, negotiated, and collaborative inquiries that are propelled by scientists imagination and bound only by their observation of the natural world (Abd-El-Khalick, 2013)

Research on NOS

NOS has been the subject of intensive research during the past 64 years. Lederman (1992) presented a comprehensive review of this research. He noted that research related to NOS was conducted along four related, but distinct lines. These lines are:

1. Assessment of students' conception of NOS.
2. Development, use, and assessment of curricula designed to 'improve' students' conception of NOS.
3. Assessment of, and attempt to improve, teachers' conception of NOS, and
4. Identification of the relationship among teachers' conceptions, classroom practice and students conceptions (Lederman, 1992, p332)

In this paper I am reviewing literature in the third line of research above, that is, assessment of, and attempt to improve teachers' conception of NOS. I divide the third line of research in two subsections, that is, (a) Research on assessment of science teachers' conception of NOS and (b) Research on improving science teachers' conception of NOS.

Research on Assessment of Science Teachers' conception of NOS

The first assessment of teachers' conception of NOS was conducted by Anderson (1950). Ninety six (96) Minnesota high school teachers, including 58 biology teachers and 38 chemistry teachers constituted the sample to be surveyed. Teachers were asked to answer a total of eight questions on scientific method, and it was revealed that both groups of teachers possessed serous misconceptions.

Behnke (1961) used a 50- statement questionnaire to assess the understanding of scientists and science teachers NOS views. Using a three-option response format (that is, favoring, opposing and neutral), the questionnaire attempted to assess four categories of information (a) the nature of science, (b) science and society, (c) the scientists and society, (d) the teaching of science. The teacher sample consisted of 300, but there was no differentiation based upon specific discipline. Over 50 percent of the science teachers felt that scientific findings were not tentative. Even more surprising was that 20 percent of the scientists felt the same way.

Miller (1963) compared TOUS scores of secondary biology teachers and secondary students. Five students groups consisted of prospective biology students, as well as those who had just completed a course in general biology. The students groups spanned grades 7-12. The 87 11th and 12th grade students were of high ability. Sixty-three 10th grade biology students, 52 9th grade, 328 8th grade, and 205 7th grade students constituted the remaining portion of the student sample. The sample of teachers consisted of 51 biology teachers from 20 Iowa high schools. Overall, a surprising percentage (ranging from 11 percent to 68 percent) of students in grade 9-12 scored higher in the TOUS than 25 percent of the science teachers. Of particular concern was the finding that 68 percent of the high-ability grade 11-12 students scored higher than 25 percent of the science teachers. Although the students were considered as a group (and not specifically compared with their own teachers), Miller(1963), concluded that many teachers did not understand science well as their students, much less understand science well to teach effectively.

Schmidt (1967) attempted to replicate Miller's findings several years later. A disconcerting proportion of students in grade 9 and 11-12 were found to score higher (14 percent and 47 percent, respectively) than 25 percent of the teacher sample. Schmidt concluded that, the problem identified by Miller four years earlier still existed.

A year later, Carey and Stauss (1968) attempted to determine whether 17 prospective secondary science teachers being prepared at the University of Georgia possessed a philosophy of science that exhibited an understanding of NOS. The Wisconsin Inventory of science process (WISP) was used to assess NOS. In addition to attempting an initial assessment of the conceptions possessed by the pre-service teachers, an attempt was made to investigate the effectiveness of science method course in improving such conception. Pre-test scores on WISP indicated that, the science teachers as a group, did not possess adequate conception of NOS. Correlation of WISP scores with academic variables such as high school science credits, college science credits, specific science courses taken, grade-point average, and mathematics grades, did not yield any significant relationship. Based on WISP post-test scores. It was conclude that a method course "specifically oriented toward NOS" could significantly improve teachers' viewpoints.

Carey and Stauss (1970) continued their line of research by assessing experienced teachers conception of NOS. Once again, they used the WISP exam. The results were consistent with their previous study: (a) teachers of science, in general, did not possess adequate conception of NOS; (b) science method courses produce a significant pre to posttest improvement of WISP scores; and (c) academic variables such as grade-points average, math credits, specific courses, and years of teaching experiences are not significantly related to teachers conception of science. They recommended that courses in history and philosophy of science be included in teacher preparation programs.

Using a case-study approach, Aguire, Haggerty and Linder (1990) assessed 74 pre-service secondary science teachers' conception of NOS, teaching and learning. Subjects were asked to respond to 11 open ended questions about science, teaching of science and learning of science. Qualitative analysis of the responses yielded the following general conclusions. Most individuals believed that science was either a body of knowledge consisting of collections of observations and explanations or of proportions that have been proved to be correct. Subjects were evenly divided among the "dispenser of knowledge" and "guide/ mediator of understanding" conception of teaching. Aguire et al. (1990) concluded that these pre-service teachers (even though they all possessed undergraduate science degrees) did not possess adequate conceptions of the NOS. The author further concluded that, there could be some connection between teachers' views of NOS and their conceptions of learning and teaching (although observations of actual instruction were not attempted.

Research on teachers' conception of science is not limited to secondary teachers. Bloom (1989) assessed pre-service elementary teachers understanding of science and how certain contextual variables contribute to this understanding. Using a sample of 80 pre-service elementary teachers (86 percent female), enrolled in three method courses, he administered a questionnaire that contained six questions related to knowledge of science, theories and evolution. Additionally, a 21 item rating scale pertaining to prior experience with science, NOS, science teaching, and evolution/ creationism was administered. A qualitative analysis of questionnaire responses revealed that the pre-service primary science teachers believed science is people centered, with its primary purpose of being for the benefit of human kind.

Ajaja (2012) assessed the conception of science teachers about the NOS. The sample consisted of 400 science teachers drawn from senior secondary schools in Edo and Delta State of Nigeria. He found that, a higher percentage of science teachers selected options, which agreed with the traditional views of NOS. There was no significant difference between NCE, B.S.Ed. and BS. Holders in the conception of science. Ajaja (2012) concluded that, this trend of conception of NOS could only be reversed through a deliberate science teacher preparatory curriculum reforms to include elements of constructivism.

Khajornsak (2010) explored the history of NOS beliefs among pre-service and in-service teachers primarily in US and Thailand. His study was guided by two research questions: (a) what is pre-service and in-service science teachers' conception of NOS, particularly with scientific enterprise? (b) What are the similarities and differences between pre-service and in-service teachers conception of NOS. The Myths of Science Questionnaire (MOSQ) was used to explore pre-service and in-service science teachers' conception of NOS. The findings indicated that, only five pre-service teachers demonstrated the informed conception that theories and laws are equally credible In addition, nearly one third of pre-service and in-service teachers (30.4 percent and 31 percent) were unsure whether theories are less secure than laws. Most of the pre-service and in-service teachers (80.4 percent and 84.8 percent) held the uninformed view that laws are mature theories (Khajornsak, 2010).

Recently, Bartos and Lederman (2014), investigated the relationship between four physics teachers' knowledge structures for NOS and Scientific Inquiry (SI), and their classroom practice. The degree of consistency between the two knowledge structures was gauged at the level of included concepts, connections between concepts, and for other organizational or thematic elements. The results indicated limited consistency between teachers knowledge structure for NOS and SI, and those supported in their classroom practice. Bartos and Lederman (2014) recommended that, it is necessary for teacher candidates to explicitly reflect on structure of subject matter they are learning.

Most of the study reviewed above concluded that science teachers did not possess the required NOS knowledge. However most of researchers used mainly quantitative approach/ instrument to assess the NOS conception of science teachers especially in the 20th century. Though some researchers in this 21st century are trying to use both the quantitative and qualitative approach to assess/evaluate the NOS conception of science teachers. In my opinion, it is better to use both the quantitative and qualitative approach because the NOS conception is more an attitude than just the knowledge of an individual.

As a number of researchers were busy conducting research to assess the NOS conception of pre-service and in-service teachers, other researcher were also doing research to improve the NOS conception of science teacher. Here below are some of the researchers who conducted research to improve the NOS of science teachers.

Research on Improving Science Teachers' Conception of NOS

According to the above reviewed research on assessment of NOS conception of science teacher, researcher after researchers were indicating that science teachers did not possess the contemporary views of NOS. And some researcher's recommended strategies how to improve the NOS conception of pre-service and in-service science teachers. Many researchers have been conducting research to improve the NOS conception of science teachers, considering the fact that the teachers are very significant variable for anybody who try to improve scientific literacy of any country.

Generally two types of approaches have been undertaken by researchers to help to improve science teachers' conception of NOS. The fist, labeled by scholars an '***implicit***' approach, "suggest that an understanding of NOS is a learning outcome that can be facilitated through process skills in instruction, science content course work, and 'doing science'" (Abd-El-Khalick et al, 2000). Researchers who adopted this implicit approach as Abd-El-Khalick et al, (2000) summarize it, employed, science process skills instructions and scientific inquiry activities (Barufaldi, Bethel, & Lab, 1977; Riley, 1979; Trembath, 1972) or manipulated certain aspects of learning environments (Haukoos & Penick, 1983; Scharmann, 1990; Scharmann & Harns, 1992; Spears & Zollman, 1977) in their instruction with the aim to promote teachers NOS conceptions. Advocate of this implicit approach assumed that learning about NOS would result in a byproduct of the learners' engagement in science-based activities. They expected science teachers to learn about NOS as a result of changes in learning environment despite the absence of any direct reference to NOS. For example Barufaldi et al (1977) noted that "students presented with numerous hands on activity centered inquiry oriented science experience----should have developed a more tentative view of science" (p291).

The second approach, labeled as ***'explicit'*** approach, suggest that an understanding of NOS can be increased if learners are provided with opportunities to reflect on their experiences from within a conceptual framework that explains some aspects of NOS (Abd-El-Khalick et al, 2000). Researchers who adopted this approach to improve teachers' understanding of NOS (AKindehin, 1988; Billeh & Hasan, 1975; Carey & Strauss, 1968; 1970; Janes, 1969; Lavach, 1969, Onyunniyi, 1983) adapted elements from the history and philosophy of science, and instruction geared towards the various aspects of NOS to improve teachers conception of NOS (Abd-El-Khalick et al, 2000).

Some of the researchers in this 21st century have tried to investigate the effectiveness of the two approaches in improving the science teachers' conception of NOS. For instance, Straits and Nichols (2007) explored the possibilities of using historical nonfiction and literature cycles to develop elementary teachers NOS understanding. They argued that instruction of NOS may be problematic if portrayed as either a solely cognitive or discursive endeavor, overlooking other aspects of epistemology, such as aesthetic stance refers to individuals responses during the readings as they create links between the text and their own lives, prompting personal and emotional connections to NOS. They recommended that incorporating critical narrative pedagogy within processes of science inquiry may provide elementary teachers-learners alternative connections within science-teaching and learning. They presented a practical techniques and theoretical rationale for teaching NOS using literature circles.

Njaz (2009), investigated the progressive transition in chemistry teachers understanding of NOS in the context of historical controversies. The study was based on 17 in-service teachers who had registered for an 11 week course on 'investigation in the teaching chemistry as part of their Master degree program. The course was based on 17 readings drawn on a history and philosophy of science perspective with special reference to controversial episodes in the chemistry curriculum. Course activities included written reports, classroom discussions based on participants' presentation and written exams. Based on the results obtained, it was suggested that this study facilitated the following progressive transition in teachers understandings of NOS: (a) Problematic nature of scientific method, objectivity and the empirical basis of science; (b) Myths associated with respect to the NOS and teaching of chemistry; (c) Science does not develop by appealing to objectivity in an absolute sense, as creativity and presupposition also play a crucial role; The role speculation and controversy in the construction of knowledge based on episodes from chemistry curriculum; (e) How did Bohr confirm his postulates? This goes beyond treatment in most textbooks; (f) Differentiation between the idealized scientific law and the observations. It was concluded that given the opportunity to reflect, discuss and participate in a series of course activities based on various controversial episodes, science could be enhanced (Njaz, 2009).

Seung, Bryan and Butler (2009), investigated changes in pre-service teachers understanding of NOS, as a result of four activity-based interventions that represent three instructional approaches used in a middle grade science method course. Ten participants' understanding of NOS and their perceptions were investigated. Data were collected using open-ended questionnaire and in-depth interviews before and after interventions. Written artifacts and recorded group discussions were collected during the interventions. The study found out that, inclusion of various approaches to teaching NOS can contribute to developing pre-service teachers understanding of NOS (Seung, et al 2009). The activities complemented each other in teaching of NOS components. In additions, the pre-service teachers perceived that the four interventions were helpful in improving their understanding of NOS and in preparing them for future teaching (Seung, et al 2009)

Seung, et al (2009), study was one of the few which applied qualitative approach in assessing the NOS conception of pre-service science teachers.

Bell, Matkins and Gansneder (2011), using a mixed methods investigation compared the relative impacts of instructional approach and context of NOS instruction on pre-service elementary teachers' understanding. The sample considered of 75 pre-service teachers enrolled in four sections of an elementary science method course. Independent variables included instructional approach to teaching nature of science (implicit vs. explicit) and the context of NOS instruction (as a stand-alone vs. situated within instruction about global climate change and global warning). These were randomly applied to the four class sections along 2x2 matric, permitting the comparison of outcomes for each independent variable separately and in combination to those of the control group. Data collection spanned the semester long course and included written responses to pre- and post-treatment of the VNOS-B, semi-structured interviews and a variety of classroom artifacts. Qualitative methods were used to analyze the data with the goal of constructing profile of participants' understanding of NOS and of global climate change/global warming (GCC/GW). The profiles were compared across treatments using non-parametric statistics to assess the relative effectiveness of the four instructional approaches. Their results indicated that pre-service teachers who experienced explicit instruction about the NOS made statistically significant gains in their views of NOS regardless of whether the NOS instruction was situated within the context of GCC/GW or as a stand-alone topic. Further, the participants who experienced explicit NOS instruction as stand-alone topic were able to apply their understanding of NOS appropriately to novel situation and issues (Bell, et al, 2011). They hence concluded that explicit NOS instruction has great potential for developing elementary science teachers' with more complete understanding of NOS.

Ozgelen, Hanuscin and Yilmaz-Tuzin (2013), they examined the connections the elementary pre-service science teachers made among various aspects of NOS. The total 45 science teachers who were enrolled in the laboratory Application in science II course participated in the study. The course provided meaningful and practically inquiry based experiences, as well as explicit and reflective instruction about NOS. The study design was qualitative and descriptive in nature. Data sources included pre-service teachers' responses for VNOS-B, semi-structured interviews, and pre-service teachers weekly written reflections about NOS. Data analysis focused on pre-service teachers' ability to connect their understanding of the various aspects of NOS to one another. Forty-three (43) (96%) of pre-service teachers made connections among NOS aspects and generally, these connections were emphasized at the end of the semester following interventions (Ozgelen et al, 2013). These findings support the notion that the reflective component of explicit-and-reflective instruction provide opportunities for pre-service teachers to revisit their ideas about NOS aspects throughout instruction in such a way that foster building of connections across aspects of NOS (Ozgelen, et al, 2013)

In another study, Ozgelen, Yilmaz-Tuzin, and Hanuscin (2013), investigated the effects of the inquiry-based and explicit laboratory instructions on pre-service science teachers (PSTs) conception of NOS aspects. The study was carried out during the laboratory Application in Science II course. All 52 pre-service elementary science teachers enrolled in the course consented to participate in the study, 37 were female and 15 were male, with an average age of 22.8 years. All had the same science major background, and all of them were juniors. The course provided meaningful and practical inquiry-based experiences as well as explicitly and reflective instruction about NOS. The study was basically qualitative and exploratory in design. At the beginning of the study, the views of NOS questionnaire version B open-ended questionnaire were applied to explore PSTs NOS views. At the end of the semester, the same questionnaire was conducted to determine the impact of the explicit-reflective and inquiry-based laboratory instructions. The results showed that many PSTs improved their views of NOS in each element although to different degree (Ozgelen et al, 2013).

Ozgelen, et al, (2013) findings suggest that explicit approach mixed with inquiry based laboratory instruction may be more effective in improving the NOS conception of pre-service science teachers than just using explicit instruction only.

Conclusion

For the last 64 years, researchers in science education have conducted a number of studies to assess and improve the NOS conception of pre-service and in-service teachers. Most of the research reviewed on assessing the NOS conception of science teachers in the 20th century, researchers utilized a quantitative approach/ instrument to measure science teachers' conception of NOS. But the recent studies in this 21st century (last ten years), some researchers are using both quantitative and qualitative (In-depth interviews) approaches (mixed methods) to assess NOS conception of science teachers. In my opinion, I think it is better to use both qualitative and quantitative approach because NOS is more an attitude than just a cognitive aspect.

On the other hand, there are two approaches to improve NOS conception of science teachers, that is ***'implicit'*** and ***'explicit'*** approaches. Most of the researchers for the last 64 years argue that the explicit is more effective than the implicit approach. However a few researchers in this 21st century are arguing that both implicit and explicit approach need to be utilized if we are to improve pre-service science teachers' conception of NOS (Ozgelen et al, 2013). I think it is better to use both explicit and implicit approach because action speaks launder than words. Hence science teacher educators need to teach with and also teach about the NOS in their lessons in order to improve the NOS conception of science teachers.

References

Abd-El-Khalick, F. (2013). Teaching with and about nature of science, and science teacher knowledge domains. *Science & Education, 22*(9), 2087-2107. doi:10.1007/s11191-012- 9520-2

Abd-El-Khalick, F., & Lederman, N., G. (2000). Improving science teachers' conception of nature of science: A critical review of literature. *International Journal in Science Education, 22(7), 665701.*

Aguirre, J. M., Haggerty, S. M., & Linder, C. J. (1990). Student-teachers' conception of science, teaching and learning: A case study in preservice science education. *International Journal of Science Education, 12 (4), 381-390.*

Ajaja, P. O. (2012). Senior secondary school science teachers in delta and edo states conceptualization about the nature of science. *International Education Studies, 5*(3), 67-85. doi:10.5539/ies.v5n3p67

Akindehin, F., (1988). Effect of an instructional package on preservice science teachers' understanding of the nature of science and acquisition of science related attitudes. *Science Education, 72,* 7382.

Anderson, K.E. (1950). The teachers of science in a representative sampling of Minnesota schools. *Science Education,* 34 (1), 57-66.

Bartos, S. A., & Lederman, N. G. (2014). Teachers' knowledge structures for nature of science and scientific inquiry: Conceptions and classroom practice. *Journal of Research in Science Teaching, 51*(9), 1150-1184. doi:10.1002/tea.21168

Barufaldi, J. P., Bethel, L. J., & Lamb, W. G. (1977). The effect of science methods course on the philosophical view of science among elementary education majors. *Journal of Research in Science Teaching. 14 (4), 289294.*

Behnke, F.L., (1961). Reaction of scientists and science teachers to statements bearing on certain aspects of science and science teaching. *School Science and Mathematics, 61, 193-207.*

Bell, R. L., Matkins, J. J., & Gansneder, B. M. (2011). Impacts of contextual and explicit instruction on preservice elementary teachers' understandings of the nature of science. *Journal of Research in Science Teaching, 48*(4), 414-436. doi:10.1002/tea.20402

Billeh, V., Y., & Hasan, O.E (1975). Factors influencing teacher gain in understanding the nature of science. *Journal of Research in Science Teaching, 23(3), 209219.*

Bloom, J.W. (1989). Preservice elementary teachers' conception of science, theories and evolution. *International Journal of Science Education*, 11(4), 401-415.

Carey, R. L., & Stauss, N.G. (1968). An analysis of the understanding of the nature of science by prospective secondary science teachers. *Science Education*, 52 (4), 358-363.

Carey, R. L., & Stauss, N.G. (1970). An analysis of the relationship between prospective science teachers'' understanding of the nature of science and certain academic variables. *Georgia Academy of Science*, 148-158

Carey, R., L., & Stauss, N., G., (1968). An analysis of the understanding of the nature of science by prospective secondary science teachers. *Science Education, 52, 358363*.

Carey, R., L., & Stauss, N., G., (1970). An analysis of experienced science teachers' understanding of the nature of science. School Science and Mathematics, 70,366376.

Central Association for Science and Mathematics Teachers (1907). A consideration of the principles that should determine the courses in biology in secondary schools. *School Science and Mathematics, 7,241-247.*

Duschl, R.A (1988). Abandoning the scientific legacy of science education. *Science Education, 72, 51-62.*

Haukoos, G., D., & Penick, J., E. (1983). The influence of classroom climate on science process and content achievement of community college students. *Journal of Research in Science Teaching, 20 (7), 629637.*

Jones, K., M. (1969). The attainment of understanding about the scientific enterprise, scientists, and the aims, and methods of science by students in a college physical science course. *Journal of Research in Science Teaching, 6, 4749.*

Khajornsak, B. (2010). Pre-service and in-service science teachers' conceptions of the nature of science. *Science Educator*, *19*(2), 35.

Lavach, J., F. (1969). The organization and evaluation of an in-service program in the history of science. *Journal of Research in Science Teaching, 6, 166170*.

Lederman, N.G. (1992). Students' and teachers' conceptions of the nature of science. A review of the research. *Journal of Research in Science Teaching, 29(4), 331*-359.

Lehesvuori, S., Viiri, J., & Rasku-Puttonen, H. (2011). Introducing dialogic teaching to science student teachers. *Journal of Science Teacher Education, 22*(8), 705-727. doi:10.1007/s10972-011-9253-0

Miller, P. E. (1963). A comparison of the abilities of secondary teachers and students of biology to understand science. *Iowa Academy of Science, 70, 510*-513.

National Research Council (1996*). National Science education standards*. Washington, DC: National Academic press.

National Science Teachers Association (1982). *Science-technology-society: science education for 1980's* (An NSTA *position statement*). Washington .DC. Author

Niaz, M. (2009). Progressive transitions in chemistry teachers' understanding of nature of science based on historical controversies. *Science & Education, 18*(1), 43-65. doi:10.1007/s11191-007-9082-x

Ogunnyiyi, M., B. (1983). Relative effects of a history/philosophy of science course on students' teachers' performance on two models of science. *Research in Science & Technological Education, 1,193199.*

Ozgelen, S., Hanuscin, D. L., & Yılmaz-Tuzun, O. (2013). Preservice elementary science teachers' connections among aspects of NOS: Toward a consistent, overarching framework. *Journal of Science Teacher Education, 24*(5), 907-927. doi:10.1007/s10972- 012-9274-3

Ozgelen, S., Yilmaz-Tuzun, O., & Hanuscin, D. L. (2013). Exploring the development of preservice science teachers' views on the nature of science in inquiry-based laboratory instruction. *Research in Science Education, 43*(4), 1551-1570. doi:10.1007/s11165-012-9321-2

Rebecca, M., K., Kimberly, H., L., & Carol L W., (2009). Inservice elementary and middle school teachers' conceptions of photosynthesis and respiration. *Journal of Science Teacher Education, 20*(1), 41. doi:10.1007/s10972-008-9117-4

Reley, J., P. (1979). The influence of hands on science process training on preservice teachers' acquisition of process skills and attitude toward science and science teaching. *Journal of Research in Science Teaching, 16, 373384.*

Scharmann, L., C. (1990). Enhancing the understanding of the premises of evolutionary theory: The influence of diversified instructional strategy. *School Science and Mathematics, 90(2), 91100.*

Scharmann, L., C., & Harris, W., M. Jr. (1992).Teaching evolution: Understanding and applying the nature of science. *Journal of Research in Science Teaching, 29, 375388.*

Schmidt, D.J (1967). Test on understanding science. A comparison among school groups. *Journal of Research in Science Teaching 5 (*4), 365-366.

Seung, E., Bryan, L. A., & Butler, M. B. (2009). Improving preservice middle grades science teachers' understanding of the nature of science using three instructional approaches. *Journal of Science Teacher Education, 20*(2), 157-177. doi:10.1007/s10972-009-9130-2

Spears, j., & Zollman. D. (1977). The influence of structured verses unstructured laboratory on students' understanding the process of science. *Journal of Research in Science Teaching, 14, 3338.*

Straits, W. J., & Nichols, S. E. (2007). Using historical nonfiction and literature circles to develop elementary teachers' nature of science understandings. *Journal of Science*

Teacher Education, *18*(6), 901-912. doi:10.1007/s10972-007-9070-7
Trembath, R., J. (1972). The structure of science. *The Australian Science Teachers Journal, 18, 5963.*

TOTAL REWARDS AND ACADEMIC STAFF PERFORMANCE IN THE COLLEGE OF EDUCATION AND EXTERNAL STUDIES, MAKERERE UNIVERSITY

Betty Twesiime
Makerere University, Kampala
naki4c@gmail.com

*No organization is better than its employees because employees are the most valued assets in an organization. Therefore, for academic organizations to achieve excellence their academic staffs have to show high levels of performance. For organizations wishing to achieve the set aims, their employees must perform effectively. Unfortunately the performance of academic staff in the College of Education and External Studies, Makerere University has been reported to be low. The purpose of the study was therefore to establish the relationship between total rewards and the Performance of academic staff in the College of Education and External studies, Makerere University. The study was guided by two objectives namely; to establish the relationship between (a) financial, (b) non-financial rewards and academic staff performance in the said college of Education and External studies. Data was generated through interviews and observations. Quantitative data was analyzed by use of SPSS version and qualitative data was generated by use of grounded theory. The findings indicated a positive significant relationship between (i) financial rewards and academic staff performance service delivery at r = 0.549** sig =0.000 which was less than 0.05,indicating a highly positive significant, (ii) non-financial rewards and academic staff performance indicating r =0.429** sig =0.000,indicating a medium positive relationship, interviews and observation revealed that staff were of the view that there was need to promote achievement, autonomy, recognition, and develop skills, training career development opportunities and high quality leadership in the college of education and external studies. Hence the study concluded that much as there was a positive significant correlation, it was medium in nature therefore there could be other factors that affect the performance of academic staff in the college of education and external studies in Makerere university. The study therefore recommended that Government, through the Ministry of Education and Sports, Ministry of Finance and economic planning, College administrators, managers and other stakeholders should provide the academic staff with the required rewards to enhance their performance in the College of Education and External Studies, Makerere University and also further research should be carried out to establish other factors that could be affecting the staff performance other than total rewards.*

Keywords: Financial Rewards, Non-Financial Rewards, Academic Staff Performance

Background of the Study

The academic staff of higher education institution is a key resource to institution's success. Academic staff, in particular, accounts for a significant component of the budget of higher education institutions and has a major role to play in achieving the objectives of the institution. The performance of academic staff, both as teachers and researchers and also as managers, determines, to a large extent, the quality of the student experience of higher education and has a significant impact on student learning and thereby on the contribution that such institutions can make to society. According to Rowley (2009), most higher education institutions have an implicit or explicit mission to offer a high quality learning experience to all their students. For him, academic staff manages this learning experience and are the main interface with students. Consequently, their motivation is crucial in determining the quality of this interface. Similarly, Dessler (2003) states that, without increased motivation and morale of the employees the organization risks losing valuable employees and will be at a disadvantage in attracting potential top talents. Exceptionally, well-motivated academic staff can, with appropriate support, build a national and international reputation for themselves and the institution in the research, publishing and professional areas. a profile may have a significant impact on the ability of the institution to attract high caliber students, research funds and consultancy contracts. Reward can serve the purpose of attracting prospective job applicants, retaining valuable employees, motivating employees, as well as assisting achieving human resource objectives and obtaining competitive advantage (Bratton and Gold, 2007). This is particularly important min competitive academic climate where colleges and universities are fighting for high-caliber employees in order to improve the quality of teaching and gaining excellent reputation .The very important motivating factor for people joining and continuing in an organization is the kind of work they get, and the reputation they enjoy in the organization. There are a wide variety of methods available for motivating staff, from recognizing the employee's achievements by simply saying 'thank you' to more complex schemes that combine and set targets with fixed rewards.

All efforts must be geared towards developing workers interest in their job so as to make them happy in giving their best to their work, this will ensure industrial harmony. In view of this, this study attempts to establish the relationship between total rewards and the Performance of academic staff in the College of Education and External studies, Makerere University, in order to address problems arising from motivational approaches in university settings.

Vroom (1964), supported the assumption that workers tend to perform more effectively if there wages are related to performance which is not based on personal bias or prejudice, but on objective evaluation of an employees merit. Though several techniques of measuring job performance have been developed, in general the specific technique chosen varies with the type of work. However, when they anticipate that rewards are not available and not fair in relation to efforts put in the organization, their performance will go down hence relevance of the theory to the study. It was on the basis of this theory that the study proposed that the assumption made and tested that academic staff performance in the College of Education and External Studies, was influenced by financial and non- financial rewards all of which are a function of total rewards.

All these issues call for research efforts, so as to bring to focus on how an appropriate reward package can jeer up or influence workers to develop positive attitude towards their job and thereby increase their productivity.

Like wise The MUASA executive noted, with great concern, that for a long time Makerere University Academic Staff have been poorly remunerated. This has had several negative impacts on academic staff morale, retention, motivation, self-esteem, etc leading to frustration, resignations and even early demise. Indeed their remuneration has continued to be low as shown in table 1.1, 1.2 and 1.3 in spite of the previous attempts by the MUASA executive to have it adequately addressed.

The salary increases since 1996 are very negligible. For example, Table 1 indicates that the salary of a Professor increased by about Sh. 48,000 over seven-year period. In addition, the Uganda shilling depreciated compared to the American dollar. For example, if we take the salary of a Professor in 1996, it was equivalent to at least US $1,005 (i.e. 1 USD = UGX 1,050). Today, the Professor's salary is equivalent to at most US $534 (i.e. I USD = UGX 1985). This means that due to depreciation in exchange rate of the Uganda Shilling compared to the American dollar, the salaries equivalent in dollars continued to decline up to date, rendering the salaries very low and unattractive. At the same time, the cost of living as measured by the cost of living index has also been increasing. This has also meant that the household expenditure increased. This has gradually eroded the purchasing power of Makerere University academic staff.

Table 1: The Salary Structure of Academic Staff at Makerere University for 1996/97 and 2002/2003 Financial Years.

Title	Monthly Salary 1996/97		Monthly Salary 2002/03	
	Lowest UGX	Highest UGX	Lowest UGX	Highest UGX
Professor	1,056,234	1,060,287	1,104,023.00	1,108,493.00
Associate Professor	934,237	942,335	976,469.00	985,426.00
Senior Lecturer	780,465	794,654	816,896.00	832,540.00
Lecturer	576,539	586,705	668,567.36	679,776.00
Assistant Lecturer	452,307	456,361	528,560.32	533,029.91
Teaching Assistant	N/A	N/A	524,090.73	526,326.00
Graduate fellow	N/A	N/A	405,998.47	419,453.08

NB: The Monthly Salaries Indicated in Table 1 is for the Start and End of the Salary Scale.

The persistent low salaries have resulted into several unfortunate impacts. Some of these impacts are highlighted as follows, not necessarily in order of priority; low moral and self-esteem, lack of self-fulfillment in areas of specialization, feeling of insecurity of service hence on standby to leave, psychological trauma, resignation to join better paying institutions, failure to return home after sponsorship for advanced degrees, low productivity and poor outputs, lack of focus leading to decreased contact/assistance to students, less time/emphasis placed on university related works, unbearable overloads due to increased intake, frustration and early demise, inability to attract and retain highly qualified and experienced academic staff, limited time allocation to research and publication resulting into stagnation of staff in posts, inability to pay for biological children to study in good schools and inability to pay household utility bills regularly.

In view of these long-standing problems, previous MUASA Executives have made great efforts to get better salary package though results from these efforts have not been satisfactory. The current Council, therefore, has the opportunity and challenge to redress the impasse hitherto experienced.

Table 2: A Proposed Salary Structure for Academic Staff 2013/2014

Title	Old Gross	Proposed Allowance	New Gross
Vice Chancellor	4,181,816	2,929,371	7,114,187
Deputy Vice chancellor	4,076,298	2,853,409	6,929,707
Principals	4,076,298	2,853,409	6,929,707
Deputy Principals	4,076,298	2,853,409	6,929,707
Non-Scientists			
Professor	3,482,689	2,437,882	5,920,571
Assoc. Professor	3,361,918	2,437,882	5,920,261
Senior Lecturer	2,863,938	2,004,757	4,868,695
Lecturer	2,414,522	1,690,186	4,104,738
Assistant Lecturer	2,386,410	1,670,487	4,056,897
Scientists			
Professor	4,115,905	2,437,887	6,553,788
Assoc. Professor	3,973,176	2,353,343	6,326,520
Senior Lecturer	3,384,656	2,004,757	5,389,412
Lecturer	2,853,561	1,690,186	4,573,747
Assistant Lecturer	2,820,302	1,670,487	4,490,790
Total	48,067,787	31,802,908	79,873,727

The MUASA executive further notes that Makerere University is the oldest public university and, as a public institution, the government has the social and legal responsibility of effectively funding all University activities. Whereas the University is generating some income from privately sponsored programmes, the MUASA executive believes that this income should supplement government funding and not vice versa. In view of this, therefore, the considered view of MUASA is that the modest salary structure of the academic staff should, *in the interim*, be brought to at least 40% higher than it was in 1996 level. In 1996, a Professor's salary was equivalent to USD 1,005.94 (Lowest) and $1,009.80 (Highest). The 40% adjustment would then bring a Professor's salary to USD 1,408.32 (Lowest) and $1,413.72 (Highest), which is still the lowest in the region as indicated in Table 3. The proposed salaries are shown in Table 2.

Table 3: Summary of the Proposed Basic Salary Structure of Academic Staff of Makerere University in Uganda Shillings

Position	Monthly Salary (Lowest)	Monthly Salary (Highest)
Professor	2,809,590.42	2,820,371.40
Associate Professor	2,485,071.75	2,506,605.78
Senior Lecturer	2,076,036.90	2,113,910.33
*Lecturer	1,533,580.44	1,560,644.61
** Assistant Lecturer	1,203,140.61	1,213,921.59
***Teaching Assistant	1,192,918.23	1,203,615.42
Graduate Fellow	845,887.98	853,484.94

Key
***** The minimum required qualification for a lecturer is a Ph.D.
****** The minimum qualification for Assistant Lecturer is a Masters degree
******* The minimum qualification for a Teaching Assistant is a Second class upper degree

Tables 1, 2 and 3 show the general trend of salary structure changes of the academic staff from 1990's to the current salary structure. It shows that although salaries of academic staff have been undergoing several adjustments, still remains low to make fully satisfied to perform highly on their jobs. The salaries of academic staff were increased by 70% although they had requested for 100% salary increment, which is still very low.

Despite the above historical review of the salary structural changes and performance of academic staff in the university, several studies had been done relating academic staff performance on various independent variables. . Such studies included Kamwine (2004) who examined management of appraisal schemes and teacher's performance in government aided schools in Kampala District and empirically found out that teacher's appraisal on teaching methodology and lesson plans improved on their job performance. Although the above studies are related to teachers job performance, none of them was directly related to the study variables as this study; they too were carried out in different contexts hence the need to undertake this study on the effect of total rewards on academic staff performance in the College of Education and External Studies, Makerere University.

Statement of the Study

Among higher education institutions in Uganda, Makerere University is the oldest public institution known to provide higher education and contribute a lot in alleviating shortage of skilled human resources in various fields. Despite recent infrastructural growth and department expansion in various faculties, Makerere University is losing a growing number of teaching manpower yet for organizations wishing to achieve the set aims; their employees must perform effectively (Maicibi, 2007). Unfortunately the performance of academic staff in the College of Education and External Studies, Makerere University has been reported to be low (Kamoga, 2003). Likewise Auditors Generals Report 2008-2009 to 2010-11 also pointed out the inadequacy of academic staff in Makerere University in researching and publishing, the challenges that were noted to impact the teaching learning process. This inadequacy in performance might be due to poor reward strategies, policies and poor performance management skills by the university managers and administrators. This has resulted into undesirable outcomes such as students' low grades, students taking long to complete their research projects and not graduating in time. While there could be several contributing factors, however, according to Vroom's (1964) expectancy theory, financial and non-financial rewards may have played a major role, therefore this motivated the move to carry out the study to appraise the role of total rewards (financial and non financial rewards) on academic staff performance in the College of Education and External Studies, Makerere University.

Methodology

The study used a co-relational research design and cross sectional survey method. It was co-relational in that it was interested in relating total rewards to academic staff performance. The study was a cross- sectional in nature in that it involved large numbers of respondents where data was collected once and for all to reduce on time and costs involved (Amin, 2005).

The study took quantitative approach or paradigm, supplemented by qualitative approach that was used to supplement on quantitative data. Quantitative approach was suitable because the study based on variable measured with numbers and analyzed with statistical values (Creswell, 2003) cited in Bakkabulindi, (2008).

Quantitative data was analyzed by use of SPSS version 13 to generate descriptive statistics. The study hypotheses were tested using Pearson's Correlation co-efficient Index.

The Findings

The findings indicated a positive significant relationship between: (a) financial rewards and academic staff performance service delivery at r = 0.549** sig = 0.000 which was less than 0.05,indicating a highly positive significant, (b) non-financial rewards and academic staff performance indicating r = 0.429** sig = 0.000, indicating a medium positive relationship, interviews and observation revealed that staff were of the view that there was need for promotion.

Descriptions of the Dependent Variable: Academic Staff Performance

Academic staff performance, the dependent variable in the study was operationalized into eight quantitative items and a few qualitative items of the interview guide. Using the quantitative items academic staff members were requested to do their self-rating basing on the Likert's scale ranging from one that represented very rarely or never, two represented rarely, three represented very regularly. Table 4 gives pertinent results there from

Table 4: Descriptive Statistics on Academic Staff Performance

Indicators of staff performance	**Percentage**	**Mean**	**Std Deviation**
I prepare the teaching syllabus before the beginning of the term	87.7	1.89	0.903
I prepare lecture notes for my students	78.5	1.84	0.795
I always give course works and tests on time	43.1	2.06	1.028
I set and supervise students examinations	55.4	2.04	0.891
I always give students examinations and mark on time	36.9	1.86	1.013
I use different teaching methodologies e.g. discussions, presentation	52.3	1.84	0.795
I am always committed to my work and manage my time	49.2	1,92	0.796
My students get good grades and graduate on time	35.4	1.61	0.743

Table 4 shows how academic staff rated themselves on performance. The table indicates that most of the academic staff 87.7% rarely prepared the teaching syllabus before the beginning of semester. This implied that academic staffs used a definite syllabus to follow during lecture preparation. In addition academic staffs that rarely prepare lecture notes for their students were 78.5%. This suggested that most of the academic staff members in the college of education and external studies do not adequately prepare lecture notes. In the same way academic staff members showed that they rarely give course works and tests on time 75.3%.

Academic staff members showed that they rarely set and supervise students' examinations 80%. This implies that academic staff members are not involved in setting and supervising of examinations. In the same way academic staff members mark students' examinations and course works on time compared to 10.7% who regularly do the same while 7.7% neither nor regularly do the same. This implies that when academic staff members give examinations they do not mark them on time.

Academic staff members showed that they rarely use different teaching methodologies, for example, discussion, class presentations 86.1%. This is implies that academic staff members could be using poor teaching methodologies like lecture method as opposed to use of modern teaching methods like those which involve the use of information communication technology (ICT).

Academic staff showed they are rarely committed to their work and rarely manage time 80.0%. . This implies that academic staff members failed to manage their time hence poor performance since deadlines are not met. Finally academic staff members showed that their students rarely get good grades 87.7%.

Description of Independent Valuables – Financial Rewards

Financial rewards enhance the performance of academic staff in the College of Education and External Studies, Makerere University. Thus, the researcher asked respondents to do self-rating on financial rewards in the college of education and external studies. Financial rewards were conceptualized as base pay, contingent pay cash bonuses, long-term incentives, ownership, shares, and other benefit. Table 5 gives descriptive statistics on respondents self-rating on financial rewards.

Table 5: Summary Statistics on Financial Rewards of Academic Staff

Indicators of Financial Rewards	Percent	Mean	Std. Dev
I receive enough salary and on time	72.3	2.07	0.796
The wages I receive match my qualifications	80.0	1.89	0.709
The wages I receive are well defined	86.1	1.89	0.903
I get transport allowances	83.1	1.87	0.892
I get housing allowances	76.9	1.96	0.865
I get medical allowances	89.3	1.84	0.971
I get other benefits e.g. travel, air time etc.	81.4	1.76	0.964

Table 5 shows how academic staff 72.3% disagreed they get enough salary and on time. This implies that the salary given to academic staff in the college of education and external studies is not adequate to allow them perform effectively, to make it worse at times it delays. This is one of the reasons given by academic staff that led to part timing to top up on what they are given. This lack of concentration at work in search for additional sources of income to top up their salaries given to them leaves little opportunity for high job performance.

Academic staff further disagreed that the wages they receive match their qualifications 80%. This implied that even benefits given to academic staff to top up their salaries are to low yield high job performance.

Academic staff members in the college disagreed that the wages they receive are well-defined 86%. This may not adequately yield high performance on the job since wages given are more likely to be low. Most of the academic staff disagreed that they get transport allowances 83.1%. This implied that academic staff members would have high chances of coming late and even missing their lectures when they fail to raise transport. Academic staff members to a certain extent showed that they do not frequently get housing allowances 76.9%. This suggests that housing allowances of academic staff in the college of education are frequently given.

Academic staff members disagreed that they do not get medical 89.3%. This suggests that academic staff medical allowances are not appropriately administered on academic staff. Finally academic staff members in the college of education and external studies showed that to a less extent other benefits like air time, travel allowances, among others 81.4%. These Percentages mean that benefits are not fairly administered on to academic staff members in the college of education and external studies.

Academic staff members rated highest on item; I receive enough salary mean = 2.07and rated lowest on item; I get other benefits e.g. travel, air time among others mean = 1.76. These mean values all suggest that financial rewards are poorly administered on academic staff in the college of education and external studies, Makerere University.

The standard deviation was all low signifying that academic staff at the school of education and external studies had similar views and opinions about their financial rewards. To get views on how academic staff rated financial rewards all items in Table 5 were aggregated into an average index.

Description of Independent Valuables – Non-financial Rewards

Non-financial rewards enhance the performance academic staff in the college of education and external studies, Makerere University. Non-financial rewards were conceptualized as praise, recognition, promotions, learning and development, training on job, attending workshops and seminars.

Table 6: Gives Results on Description of Independent Valuables – Non-financial Rewards

Indicators of Non-Financial Rewards	Percent	Mean	Std. Dev
I am praised for the good work on my job	78.4	1.96	0.82
I am recognized as a member by management	80.5	1.83	0.97
The college has a staff promotion policy	77.0	2.03	0.82
I am entitled to learning and development e.g. PhD programs and studies	89.2	1.81	0.58
I have been trained on the job e.g. in seminars, workshops and conferences	70.8	1.98	0.97
My benefits are worth the quality and quantity of work I do	73.8	2.09	1.07

Table 6 shows the distribution of respondents' views as regards non-financial rewards. According to Table 6 the majority of the academic staff in the College disagreed that they are praised for good work at 78.4%, this talled with the mean 1.96. This suggests appreciation of academic staff works is not greatly done. In addition academic staff members disagreed that they are recognized as a members of management 80.5%. These findings suggest that academic staff members are not recognized, as they may not inquire them over various issues on job.

In addition academic staff members disagreed that they are aware that the college has a promotion policy 77.0%. This suggested that academic staff members in the college of education and external studies are not made aware of their staff promotion policy. Furthermore academic staff members disagreed that they are entitled to learning and development programs for instance PhD and other studies 89.2%. This implies that learning and staff development are not fairly distributed among academic staff members. Most of the academic staff members showed that they have not been trained on the job through seminars, workshops and conferences 70.8%. This implied that on the job training among academic staff in the college and external studies is not fairly done, finally academic staff members disagreed that benefits they get are not worth the quality and quantity of work they do 73.8%.

Testing the Study Hypotheses.

Hypothesis one. In this section the two study hypothesis were tested.

Table 7: Pearson's Correlation Coefficient Index between Financial Rewards and Academic Staff Performance

		Performance	Financial Rewards
Performance	Pearson correlation	1	0.549**
	Sig. (2 tailed)		0.000
	N	65	65
Financial Rewards	Pearson correlation	0.549**	1
	Sig. (2 tailed)	0.000	
	N	65	65

**Correlation is significant at 0.01 two tailed.

Table 7 shows Pearson's correlation co-efficient index between performance and academic staff service delivery r = 0.549**Sig. = 0.000 less than 0.05. The hypothesis was verified that there was a highly positive significant relationship between financial rewards and academic staff performance at the one percent (1%) level 2 tailed.

Hypothesis two:

Table 8: Pearson's Correlation Coefficient Index between Non-Financial Rewards and Academic Staff Performance

		Performance	Financial Rewards
Performance	Pearson correlation	1	0.429**
	Sig. (2 tailed)		0.000
	N	65	64
Non-Financial Rewards	Pearson correlation	0.429**	1
	Sig. (2 tailed)	0.000	
	N	64	65

Correlation is significant at 0.01 levels (2 tailed). Table 8 shows Pearson's correlation co-efficient index between performance and non-financial r = 0.429**, sig. =0.000. The hypothesis was verified that there was a positive significant relationship between non-financial rewards and academic staff performance in College of Education and External Studies Makerere University.

Findings

The findings were that there was a positive significant relationship between: (a) financial, (b) non-financial rewards and academic staff performance in the said college. The study concluded that there was a positive significant correlation between (a) financial, (b) non-financial rewards and academic staff performance.

Conclusions

It was concluded that financial rewards had a higher positive significant relationship with academic staff performance. Thus financial rewards may be used to enhance the performance of the academic staff performance in form of base pay, contingent pay cash bonuses, long term incentives, ownership, shares, and other benefits in order to motivate academic staff to positively performance effectively.

It was concluded that non- financial rewards have a positive significant relationship on academic staff performance; hence the need to promote achievement, autonomy, recognition, and develop skills, training career development opportunities and high quality leadership in the college of education and external studies. Hence the need to promote achievement, autonomy, recognition, and develop skills, training career development opportunities and high quality leadership in the college of education and external studies.

Recommendations

The various stakeholders, for example, the government, the Ministry of Education and Sports, the Ministry of Finance and Economic Planning and Development, the University Council and donors, should come up with new or improved reward strategies and policies that can be used as channels to improve and increase academic staff salaries and benefits. Budgeting for them effectively can do this. There is also need to create more projects and money generating activities like consultancies, research publication among others to increase on academic staff rewards.

There is need to recognize individual staff through assigning them responsibility, giving them opportunities to go for further training in their areas of specialization hence becoming more competent on the job leading to high job performance.

Areas for Further Research

Due to financial and time constraints, the study was centered on total rewards -financial and non-financial as potential variables influencing the performance of academic staff in the college of education and external studies. However, there were other variables like administrative policies, resource availability and utilization, appraisal schemes commitment, satisfaction, communication, human resource practices, among others impacting on the performance of academic staff in the College which need the attention of future researchers to undertake studies to establish their true influence on the commitment of the academic staff in the College of Education and External studies, Makerere University.

References

Amin, E. M. (2004). Foundations of statistical inference for social science research. Kampala: Makerere University Printery.

Amin, E. M. (2005). Social science Research: conception, Methodology and analysis. Kampala: Makerere University Printery.

Bakkabulindi, F. E. K. (2008).Individual characteristics affecting use of computers in Makerere University. Unpublished proposed written as prototype for training M.Ed Curriculum, teaching and media: foundations: language and lit; Psychology; science: social sciences and arts: M.Ed ICT: M.A Educ. Mgt and Adm; M.A Educ. Pol. and Plan; and Msc HRM in Educ. as part of introduction to research methods semester two 2007/ 2008, E.A Inst for Higher Educ. Studies and Dev, school of Education, Makerere University, Kampala, Uganda.

Bratton, J. (2003). Human Resource Management: Theory and Practice (3rd ed.). Pal. Grave: Macmillan Publishers Ltd.

Creswell, J. W. (2008). Research design, qualitative, quantitative and mixed approaches (2nd ed.). Thousand Oaks: Sage publication.

Kamoga, P. (2003, February 7th). Unprepared teachers in Entebbe Municipality. New Vision, P.9.

Kamwine, E. (2004). Management appraisal schemes and teachers performance in government-aided schools in Kampala District. Unpublished Masters of Education dissertation, Makerere University, Kampala, Uganda.

..Maicibi, N. A. (2007). Human resource management success. Kampala; Makerere University Printery.

AN OVERVIEW OF TEACHER PROFESSIONALISM AND INFORMATION ETHICS

Julius Tunsaje Tweve
Tumaini University Dar es Salaam College
julius.tweve@tudarco.ac.tz

A professional is held in high regard because they are more experienced than the client. A teacher is one among the professionals. To ensure that students' behaviors do not jeopardize their future careers, teachers must understand the activities that present ethical and professional issues and make every effort to educate students about appropriate behavior. For teachers, perhaps the most familiar unethical issue facing students is that of academic dishonesty. Teacher professionalism has relevant significance in education in that it affects the role of the teacher and his or her pedagogy, which in return affects the student's ability to learn effectively. This paper presents a link of features of Information ethics to teacher education so as to add new ways on how teachers will be imparted with new dimensions to address and enhance professionalism in their day today activities.

Key words: Teacher Professionalism and Information Ethic

Introduction

Professionalism is not commercialism; to be a professional, is to use education, experience and training to do work, analyze, problem solve and make sound decisions Donald at el (1999). A professional must know and deliver sound advice to the client based on accumulated knowledge. A professional is held in high regard because he or she is more experienced than the client. Commercialism is the use of marketing and advertising to sell products and services regardless of the needs and requirements of a customer. The reality of doing business is that many companies choose commercialism over professionalism. In business, the drive is to make money supersedes the passion to deliver quality, professional services (Garet 2001). In education sector, this should be contrary to it, teachers are supposed to maintain quality of education through service delivery.

Similarly, a completed definition of teacher professionalism far exceeds the simple notion that a teacher be prepared in a certain manner. A professional is trained to handle all situations, as most episodes in the classroom require quick thinking. Teacher professionalism extends beyond one's ability to understand content; the educator must discover if the students are being imparted with knowledge in an effective way. With the role of "teacher" becoming more autonomous, an educator must be competent in their studies, perform well under the eye of the administration, parents, and other stakeholders while maintaining good conduct to facilitate quality communication and education development (Allen 2010). Hence, there is a need to introduce information ethics into teacher education curricula.

Information ethics in Africa is a young academic field; not much has been published on the role that African philosophy can play in thinking about the challenges arising from the impact of ICT on African societies and culture (, 2006). A professional has legitimate and moral obligations to make sure professionalism is adhered to in decision-making. Amunga (2013) noted that introduction of information ethics in the curriculum at Kenyatta University will have contribution to behavior change, improve quality and quantity but also will curb the inadequacy of communication skills course. She further pointed out the role of information ethics it will help to curb plagiarism, add value to the quality of education and help in upholding ethical practices. The paper noted the need to introduce or integrate Information Ethics courses in teacher education curricula both in secondary schools and in higher learning institutions.

Professional Ethics

The professional carries additional moral responsibilities to those held by the population in general and in society. This is because professionals are capable of making and acting on an informed decision in situations that the general public cannot, because they have not received the relevant training Barret (1998). Ethics are rules and values used in a professional setting (Changing Minds,). In the workplace managers and supervisors should set the standard for using ethics by showing respect, being honest, and promoting trust. If the management team uses unethical forms of communication, the team and business can fail. Ethics are used world-wide in large companies and small businesses. Promoting ethics in the workplace gives employees a sense of worth and trust that can help the business and employees succeed (Joseph and Joshua, 2000). This additional knowledge also comes with authority and power. Teachers are not supposed to rely on tuition and bribe practices in order to gain more money and spend less time in normal scheduled classes (Anangisye 2010).

Ethics in Tanzania has a long history particularly from 1961 to 1985; ethics has been changing due to presidency (Tweve, 2012). During the reign of President Julius K. Nyerere 1961 to 1985 ethics among public servants was strongly observed and maintained due to Arusha Declaration. Ishumi (2009) and Kaduma, (2010), argue that in Tanzania, professional ethics is an overlooked but critical factor in complying with standards in all sectors. Tanzania code of ethics for teachers is in place to guide and control teacher professionalism (Anangisye, 2006). Other sectors such as Medical ethics under the Medical Association of Tanzania and Tanganyika Law Society are some of the organs which oversee professionalism.

After independence, teaching profession in Tanzania was one of the recognized and respected professional by leaders and community at large. Currently, teachers, at almost all levels of the education system in Tanzania, have been increasingly being implicated in all sorts of professional misconduct, ranging from sex-related behaviors, corrupt practices, use of impolite language, alcoholism, and abuse of other intoxicants, animosities and fights (Anangisye and Barrett, 2005)

Teacher Education

Teacher education refers to the policies and procedures designed to equip prospective teacher with the knowledge, attitudes, behaviours, and skills they require to perform their tasks effectively in the classroom, school and in the wider community. Curriculum the question of what knowledge, attitudes, behaviours and skills teachers should possess is the subject of much debate in many cultures Garet et al (2001). This is understandable, as teachers are entrusted with the transmission to learners of society's beliefs, attitudes and deontology, as well as of information, advice and wisdom, and with facilitating learners' acquisition of the key knowledge, attitudes and behaviours that they will enable them to be active in society and the economy. In order to achieve this, the content of information ethics should be added in teacher education curricula urgently.

Teachers' Professionalism

Teacher professionalism has relevant significance in education in that it affects the role of the teacher and his or her pedagogy, which in return affects the student's ability to learn effectively. It can be defined as the ability to reach students in a meaningful way, developing innovative approaches to mandated content while motivating, engaging, and inspiring young adult minds to prepare for ever-advancing technology. However, this definition does little to exemplify precisely how a professional teacher carries himself or herself (Anangisye and Barrett, 2005). Due to the growing autonomy being given to educators, professionalism remains one of the most influential attributes of education today; teacher professionalism contains three essential characteristics namely competence, performance, and conduct. These reflect the educator's goals, abilities, and standards, and directly impact the effectiveness of teaching through the development of qualities. Information ethics should be added to strengthen the teaching profession.

Teachers' Competence

The characteristic of competence is fundamental in an educator's pursuit of excellence; a discussion on competence focuses on three important ideas: preparation, knowledge of subject area, and defined pedagogy. The first, preparation, prepares the professional for the adversity of the classroom. From language and cultural barriers to socio-economic differences, all educators face challenges in the classroom that must be addressed by individualized techniques. "Decision making by well-trained professionals allows individual clients' needs to be met more precisely and promotes continual refinement and improvement in overall practice" (Barrett 2005). In Tanzania, this situation is reflected in teachers' curricula both in teachers training colleges and universities (Anangisye 2010). Thus, by bridging these barriers, the educator will be better prepared for classroom management and create an effective learning environment. Furthermore, by doing this, the professional teacher leads students by his or her example: one who is prepared for difficulties will be able to overcome them. In Tanzania by then self-reliance education was emphasized in primary, secondary schools and colleges.

Knowledge base. Along with preparation, a professional educator with a strong knowledge of his/her subject area has the opportunity to concern him or herself with preparing innovative techniques to teach material rather than spending significant amounts of time studying the material Brian and Steven (2003). With the advantage of knowing one's curriculum material well, the educator has more confidence in their teachings, having already placed significant thought on the material being taught. Thus, a professional is able to dwell on how to relate subject matter to the students and their cultures in an original method.

Pedagogy. The final portion of competence is discovering and assuming a defined pedagogy. A professional teacher who has a defined pedagogy has already journeyed through several trials to discover which pedagogical techniques are most effective. According to Quinn (2000), hiring teachers by subject and skill presumes that curricula priorities have been established, which means that decisions have been made about how much time will be devoted to each segment of the curriculum. Although this may take years to fine-tune, a professional is willing to self-evaluate his or her pedagogy as s/he develops it, revise their edification when deemed necessary, and apply one's ideas to a practical situation. Furthermore, by acquiring a defined pedagogy linked to information ethics, a professional creates more autonomy for him or herself, allowing for a partial release from the constraints constructed by the administration, school board, parents or any other stakeholders.

Teachers' Performance

Note that competence is essential to teacher professionalism; it is only useful if the educator is able to perform. Performance is the ability to effectively teach the concepts of a curriculum. However, this is performance defined at its most fundamental level. "As individuals, professionals have the right to perform their work as they see fit, based on knowledge acquired through specialized training" (Schnall 2009) such a quote demonstrates the essentiality of performance, which derives from both premeditated and improvisational techniques.

Application. A professional teacher educates so that students learn concepts and apply them to their lives. Although this undermines the school's emphasis on state test results, a quality educator prepares for the tests through this unique style of applying to his/her students' lives. Thus, the application of these concepts must be within the bounds of students' lives.

Dedication. Furthermore, an educator that has a high standard of performance is reliable and dedicated. This type of educator becomes an active teacher rather than a passive teacher, showing the students a genuine interest in their progress as a student. Lack of dedication of teachers may cause a lot of problems i.e. form four results 2013 in Tanzania were more than half of students failed, this one of indicators of lack of dedication among teachers because of low salaries and other motivations

Teachers' Conduct

The final characteristic of teacher professionalism, conduct, is equally as significant as the first two. The manner in which an educator carries himself or herself is a reflection on one's classroom, school, community, and educational system. Conduct is a representation of how well one takes care of himself or herself, from aesthetics to language and behavior Allen (2010). However, these are only minor qualities of conduct. Conduct also includes one's ability to initiate and maintain quality communication with all the parties involved in education: students, fellow teachers, school board, administration, and parents. It is through energetic communication by a professional that initiates understanding, whether it is a student reaching his or her potential or the professional voicing their displeasure on a newly implemented regulation. A professional teacher desires to use effective communicative skills to achieve preferred educational goals.

Components for Ethical Teachers

Anangisye and Barret (2005) pointed out that a number of professional organisations and academic institutions define their ethical approach as a number of discrete components; typically these include:

Honesty. Honesty refers to a facet of moral character and denotes positive, virtuous attributes such as integrity, truthfulness, and straightforwardness along with the absence of lying, cheating or theft. Honesty travels on a larger arc than merely telling the truth. Telling the truth involves answering a question directly without lying or attempting to deceive. Honesty involves context and answering even the unasked question. Honesty means being open about one's life.

Integrity. Integrity is a concept of consistency of actions, values, methods, measures, principles, expectations, and outcomes. In ethics, integrity is regarded as the honesty and truthfulness or accuracy of one's actions. Integrity can be regarded as the opposite of hypocrisy in that it regards internal consistency as a virtue, and suggests that parties holding apparently conflicting values should account for the discrepancy or alter their beliefs. Integrity is the inner sense of "wholeness" deriving from qualities such as honesty and consistency of character. As such, one may judge that others "have integrity" to the extent that they act according to the values, beliefs and principles they claim to hold.

Transparency. Transparency implies openness, communication, and accountability. It is a metaphorical extension of a "transparent" object being one that can be seen through. Transparent procedures include open meetings, financial disclosure statements, freedom of information legislation. Budgetary review and audits; transparency is operating in such a way that it is easy for others to see what actions are performed.

Accountability. Accountability is the concept in ethics and governance with several meanings. It is often used synonymously with such concepts as responsibility, answerability, blameworthiness, liability, and other terms associated with the expectation of account-giving as noted by Snow and Lauer (2005). Within an organization, the principles and practices of ethical accountability aim to improve both the internal standard of individual and group conduct as well as external factors, such as sustainable economic and ecologic strategies. Also, ethical accountability plays a progressively important role in academic fields, such as laboratory experiments and field research.

Confidentiality. Confidentiality is an ethical principle associated with several professions (e.g., medicine, law). In ethics, and (in some places) in law and alternative forms of legal resolution such as mediation, some types of communication between a person and one of these professionals are "privileged" and may not be discussed or divulged to third parties (Anangisye, 2006).

Respect. Respect denotes both a positive feeling of esteem for a person or other entity (such as a nation or a religion), and also specific actions and conduct representative of that esteem. Respect can be a specific feeling of regard for the actual qualities of the one respected (e.g., "I have great respect for her judgment"). It can also be conducted in accord with specific ethics of respect. Rude conduct is usually considered to indicate a lack of respect, disrespect, whereas actions that honor somebody or something indicate respect. Specific ethics of respect are of fundamental importance to various cultures. *Respect* should not be confused with *tolerance*, since tolerance doesn't necessarily imply any positive feeling.

Apart from the above ethical elements, there are challenges facing teachers not only in Tanzania but also regionally and internationally. The quality of learning and competency level of both students and teachers in Tanzania is among the poorest in the region (Rodrigues 2015). One of the reasons is the low level of educational qualifications required to become a primary and secondary school teacher. Other challenges include poor certification, bullying in teaching, mobbing, and sexual harassment,

Academic Dishonesty

Academic dishonesty or academic misconduct is any type of cheating that occurs in relation to a formal academic exercise. Anangisye (2010) listed some of misdemeanors mainly committed by teachers in different levels primary, secondary and universities include:- plagiarism, fabrication, deception, cheating, bribery, professional misconduct, impersonation and sabotage. Academic dishonesty has been documented in most every type of educational setting from elementary school to graduate schools. Throughout history this type of dishonesty has been met with varying degrees of approbation. Today, those who are a part of an educated society tend to take a very negative view of academic dishonesty. Information ethics is one the means to inculcate ethical practices among students and teachers.

Effects of academic dishonest; cheating in academia has a host of effects on students, on teachers, on individual schools, and on the educational system itself. Some of the effects are:- dishonest, lack of graduants' reputation, unproductive, emotional distress, lack of institutional reputation, lower down quality, poor learning atmosphere and loose identity and integrity.

Deterrence or Punishment

Punishments for academic dishonesty vary according to the age of the party involved and the nature of the infraction. In high school, a standard penalty for cheating is a failing grade; in college, it can result in expulsion or dismissal (at Tumaini University for instance, there are no lesser penalties than dismissal for breaches of the honour code). In rare instances, professors all over the world have been fired when it was discovered that they plagiarized during college or graduate school. All parties involved in the dishonesty not just the individual whose grade is increased by it can be punished.

Information Ethics in Tanzania

The extent of information ethics adherence in information services provision among information professionals in Tanzania is improving in one way or another. Information ethics adherence involve intellectual property, user privacy, accessibility, authenticity, currency, reliability, safety, security, integrity, accuracy, surveillance, impartiality, avoidance of plagiarism, confidentiality, avoidance of bias, access to information and transparency to mention a few. They involve in the creation, storage and dissemination of information. Lack of efficiency and effectiveness due to lack of ethics in the information management field is directly linked to the persistence of corruption and fraud (Tweve, 2012). Information professionals, like any other professionals need to abide by ethics and professionalism practices. Teachers, at almost all levels of the education system in Tanzania, have been increasingly being implicated in all sorts of professional misconduct, ranging from sex-related behaviors, corrupt practices, use of impolite language, alcoholism, and abuse of other intoxicants, animosities and fights (Anangisye and Barrett, 2005). Hoel and Cooper (2000) argue that lack of information ethics adherence among professionals hinders privacy and leads to the loss of properties and rights. Further, he points out that it is expected that professionals shall engage in principled conduct whether on their own behalf or at the request of employers, colleagues, clients, agencies or the profession itself.

Challenges in Information Profession

Organisations are confronted with many information management problems and issues. In many ways, the growth of electronic information (rather than paper) has only worsened these issues over the last decade or two (Quinn 2011). Common information management problems include: Large number of disparate (unlike) information management systems, little integration or coordination between the available information systems, direct competition between information management systems and work habits. Others are lack of a clear strategic direction for the overall technology environment, limited and patchy (irregular) adoption of existing information systems by staff, poor quality of information, including lack of consistency, duplication, and out-of-date information, little recognition and support of information management by senior management.

Other challenges include limited resources for deploying, managing or improving information systems, difficulties in changing working practices and processes of staff and internal politics impacting on the ability to coordinate activities enterprise-wide (Quinn 2005). While this can be an overwhelming list, there are practical ways of delivering solutions that work within these limitations and issues. Similarly Ocholla (2009), points outs some of challenges in teaching information ethics in Africa as: lack of expertise, poor understanding or lack of appreciation of information ethics, lack of space in information studies curricula and unsatisfactory professional practices just to mention a few.

Information Ethics Compliance

Hence the above section explains the expected information profession is not what the individual does rather how he does the job. Moreover in teaching, guiding regulations of information professionals in Tanzania insist that must be aware and comply with the professional ethics. According to Tweve, (2012), the professional ethics include but not limited to:- quality of information, positive mental attitude, effective communication, customer satisfaction, accurate and currently, privacy and secrecy, ownership, accountability, accessibility and competency. In the information field a professional is to be competency on the information he/she provide to the people and avoid to make excuses on the poor information but find the solution to get the right information. This also can be applied to any teacher by providing accurate and relevant information to students and the society at large.

Recommendations

In order to make sure teacher education produce the required results, there is a need to introduce information ethics in teacher education programs both in secondary and higher learning institutions. Apart from that, other recommendations to maintain professionalism to teacher, these should be considered:

Workshops and Seminars

In door workshops and seminars, as well as university linkages and partnership activities such as faculty exchanges and joint curriculum development projects. The new stage of the

Program focuses on in-country training of an increased number of master teacher trainers, while continuing to build the capacity of Tanzania teacher training institutions.

Mentoring

The allocation to each beginning teacher of an experienced teacher, specifically trained as a mentor; the mentor may provide emotional and professional support and guidance; in many U.S. states, induction is limited to the provision of a mentor, but research suggests that, in itself, it is not enough. Teaching involves the use of a wide body of knowledge about the subject being taught, and another set of knowledge about the most effective ways to teach that subject to different kinds of learner; it therefore requires teachers to undertake a complex set of tasks every minute. Many teachers experience their first years in the profession as stressful. The proportion of teachers who either do not enter the profession after completing initial training, or who leave the profession after their first teaching post, is high.

Quality Assurance

Quality in education relates to the quality of the work undertaken by a teacher, which has significant effects upon his or her pupils or students. Further, those who pay teachers' salaries, whether through taxes or through school fees, wish to be assured they are receiving value for money. Ways to measure the quality of work of individual teachers, of schools, or of education systems as a whole, are therefore often sought. In most countries, particularly in Tanzania teacher salary is not related to the perceived quality of his or her work. Some, however, have systems to identify the 'best-performing' teachers, and increase their remuneration accordingly. Elsewhere, assessments of teacher performance may be undertaken with a view to identifying teachers' needs for additional training or development, or, in extreme cases, to identify those teachers that should be required to leave the profession. In some countries, teachers are required to re-apply periodically for their license to teach, and in so doing, to prove that they still have the requisite skills.

Conclusion

To ensure that students' behaviors do not jeopardize their future careers, educators must understand the activities that present ethical and professional issues and make every effort to educate students about appropriate behavior. For educators, perhaps the most familiar unethical issue facing students is that of academic dishonesty. The impact of academic dishonesty has long roots in working environment some of the impact are: corruption and bribery. Schools, colleges and universities have a great role on how to revisit their curriculum so as professionalism and ethics issues are included. Though both educators and students are largely familiar with the issues of academic dishonesty, it is an entirely new issue that poses the greatest threat to students' professionalism and one which has, on its face, nothing to do with students' academic performance or professional aspirations.

The paper concludes that information ethics and professionalism are the main items to consider introducing in teacher education curricula. The paper also notes that features of professionalism such as specialized knowledge, competency, honesty, integrity, accountability, and confidentiality should be considered by teachers as well as information professionals in their day to day activities. The paper also proposes issues not only teachers but also other professionals to comply with such as quality of information, positive mental attitude, effective communication, customer satisfaction, and ownership. However the paper concludes by noting that, information ethics and professionalism in Tanzania is a new field but efforts are underway to make sure teachers in Tanzania benefit from Information ethics.

Reference

Amunga H.A, (2013), Introducing information ethics in the curriculum at Kenyatta University: views from lecturers and post-graduate students; in Innovation journal of appropriate librarianship and information work in Southern Africa. Number 46 pg 25-38.

Allen, K.P. (Spring, 2010). “ Classroom management, bullying and teacher practices” The Professional Educator **34** (1).

Anangisye, W.A.L. & Barrett, A. M. (2005), Professional Identity and Misconduct: Perspectives of Tanzania Teachers. Southern African Review of Education with Education with Production, 11, 5-22.

Anangisye, W. A. L (2006), Educating Teachers, the Ethical Dimension on Teacher Professionalism in Tanzania. Doctoral Dissertation, University of Edinburgh, Edinburgh.

Anangisye, W. A. L. (2010), Genesis Development, Practices and Problems of Teacher Training: The experience from Tanzania. In K.Karras & Walhuter (eds.) International Handbook of Teachers Education World-wide (pp. 899-920). Athens: Atrapos Editions.

Barrett, A. (2005), Teacher Accountability in Context: Tanzania Primary School Teachers’ Perceptions of Local Community and Educational Administration. Compare, 35 (1): 43-61.

Capurro, R., (2006), Towards an Ontological Foundation of Information Ethics. Ethics and Information technology, 8 (4), 157-186.

Donald L. McCabe, Linda Klebe Trevino, and Kenneth D. Butterfield, (1999), "Academic Integrity in Honor Code and Non-Honor Code Environments: A Qualitative Investigation", The Journal of Higher Education 70, no. 2 (March–April 1999), 213.

Hoel, H. & Cooper, C.L.(2000), Destructive Conflict and Bullying at Work, Sponsored by the British Occupational Health Research Foundation, Manchester School of Management, UMIST (2000)

Ishumi A. G. (2009),Preparation of Education Professionals: Past, Present and Future Directions. Paper presented at the launching of the School of Education at the University of Dar es Salaam Tanzania

Kaduma Ibrahim (2010), Maadili ya Taifa na Hatma ya Tanzania: Enzi kwa Mwalimu Julius K. Nyerere. Knowledge Printers and Publishers. Dar es Salaam.

Kigongo-Bukenya I., M. N. (2007), Towards Professionalism and Commitment in Africa: The Case for Theory and Practice of Information Ethics in Uganda. International Review of Information Ethics.Vol. 7 (09/2007).

Ocholla D., (2009), Information Ethics Education in Africa: Where do we stand? The International Information and Library Review. 42, 79-88.

Rodrigues Z., (2015), Education for all, status in the Sub Saharan Africa and post 2015 education agenda. Paper presented at a Conference titled “Learning together for Change: Advanced education for all through higher education” Held in Arusha, Tanzania, April 2015.

Schnall, R.S. (2009). When Teachers Talk: Principal Abuse of Teachers / The Untold Story. Goldenring Publishing.

Tweve, J. T. (2012), “Practices of Teaching Information Ethics in Tanzania”. Paper Presented at African Network for Information Ethics (ANIE) Conference, 3rd to 7th September 2012 Held Pretoria, at Kievits Kroon Hotel.

Quinn, Michael J. (2011), Ethics for the Information Age, 4th ed. Boston, MA: Addison-Wesley.

GENDER DIFFERENCES IN LEARNING OUTCOMES ON THE MOLE CONCEPT IN A DEVELOPING COUNTRY: KENYA

Nicholas Wanjala Twoli	Janet B. Akala	David W. Khatete
Kenyatta University	Masinde Muliro University	Kenyatta University
nicholastwoli@yahoo.com	akalammust@gmail.com	dkhatete@yahoo.co.uk

The gender gap that results from the differential treatment of boys and girls is still noticeable today in their achievement and participation in chemistry education in Kenya and perhaps in every other developing country. Due to its large concept map and sometimes theoretical nature, the Mole Concept has been recognized as one of the most difficult topics to teach and learn within the secondary school chemistry curriculum. The study compared male and female form four secondary school students' learning outcomes in Mole Concept area of chemistry in Kakamega County, Kenya. The sample consisted of 384 students randomly selected from the three school types: mixed, boys and girls. Two instruments were used viz: Mole Concept Students Attitude Scale (MCSAS) and the Mole Concept Achievement Test (MCAT). Data collected were analysed using t-test. The findings of the research showed that there were significant differences between male and female students in overall chemistry achievement ($t = 4.409$, $p < 0.05$) and attitude to science ($t = 0.387$, $p < 0.05$). The absolute t-values for spatial and mathematical items 4.780 ($p < 0.05$) and 4.094 ($p < 0.05$) respectively were highly significant with boys performing better than girls. It is therefore recommended among others that teachers should use instructional strategies that will enhance gender equality in students' learning outcomes in chemistry especially in major concepts like the Mole.

Keywords: Gender, Mole Concept, Learning Outcomes, Secondary School

Introduction

Chemistry is one of the most important subjects in science. It enables learners to understand what happens around them. It is a subject filled with interesting phenomena, appealing experimental activities, and fruitful knowledge for understanding the natural and industrial worlds. As cited in Sheehan, (2010) chemistry is also a gateway to a wide range of fulfilling careers and a passport into one of the county's most valuable and successful industries. It is a launching point for a whole variety of other careers ranging from medicine through forensic science right the way through financial analysis. The study of Chemistry is therefore important in all aspects of life. As a vital tool for the understanding and application of science and technology, the discipline plays the vital role of a precursor and harbinger to the much needed chemi-technological and of course national development, which has become imperative in the developing nations of the world like Kenya. In the economic competitive environment of the developing countries each educational system is expected to 'produce' an optimum number of technologically qualified personnel who are needed by the labour market. This has implications for the planning of the educational system of each country. Not only are more science trained students expected to graduate from high school, but there is also a proportionately higher demand for female professionals as societies become more responsive to gender in science careers.

The choice of this study is predicated on the current world trend and research emphasis on gender issues following the millennium declaration of September 2000 (United Nations, 2000) which has as its goal, the promotion of gender equality, the empowerment of women and the elimination of gender inequality in basic and secondary education by 2005 and at all levels by 2015. Kenya, as a fast developing nation, is moving towards realizing her vision 2030. The Kenya Vision 2030 is the country's long-term development blue print, which aims at creation of a globally competitive and prosperous country providing a high quality of life for all its citizens. It aspires to transform Kenya into a newly industrializing, middle-income country by 2030 (Republic of Kenya, 2007). The Economic, Social and Political pillars of the vision 2030 are equally anchored on all round adoption of Science, Technology and Innovation as an implementation tool. Therefore, if Kenya is to develop economically and achieve her vision 2030 in the future, the number of people qualified in science and technology need to increase. This will only occur if student's performance in science and by extension to chemistry improves. In the past, many of the more prestigious and more highly rewarding jobs have gone to men who have been trained in science-based programs, such as medicine, engineering and technology. Since many girls have not studied science courses at school to the same extent, as have boys, such occupations have been filled by more men than women (Keeves & Kotte, 1991). Optimizing chemistry achievement and at the same time reducing differences in performance levels between boys and girls may eventually lead to greater economic efficiency within a system. In this process, gender differences can be reduced as increased opportunities become available to girls (Keeves & Kotte 1991).

Very worryingly, it has been noted that Kenyan students' performance in chemistry has been poor over the years (SMASSE, 1998; Inyega, 2005; Akala, 2010; KNEC, 2000-2010). Performance levels in chemistry are low partly because it has some topics, which are perceived as difficult that students tend to shy away from (SMASSE, 1998, 2007). Among these topics is the Mole Concept. The 'mole' is the standard method in chemistry for communicating how much of a substance is present in an entity. The importance of the topic is supported by the existence of abundant research into the problem of the teaching-learning of the mole concept in the last decades (Cervellati et al., 1982; Staver & Lumpe, 1995; Inyega, 2005; Sheehan 2010). At an ordinary practice, the mole concept is utilized in analysis of water, soil fertilizer and metals. The importance of the mole concept has been emphasized by leading scientists, for example Kolb, 1978: 54 when he stated:

> There is probably no concept in the entire chemistry course more important for students to understand than the mole and one of the main reasons the mole concept is so essential in the study of chemistry is stoichiometry.

The origin of the modern definition of the mole, was established in 1971 as '.the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is "mol".' A key point, which has been stressed subsequently by IUPAC, is that the 'elementary entities' (e.g. atoms, molecules, ions) must be specified when the term 'mole' is used. The mole as the SI unit of the 'amount of substance' underpins much of chemistry, yet remains challenging to many students and teachers alike. Successful application of the concept depends on the ability to move seamlessly between macroscopic, microscopic and symbolic levels of representation, which is often problematic for students. The use of unclear and confusing terminology also presents a barrier to many students embarking on chemistry studies.

Despite the apparent importance of both the affective and cognitive aspects of the learners in development of meaningful learning, research on the two aspects in relation to teaching and learning strategies among the learners in Kenya is limited. Much of the research that has been carried out in Kenya as relates to teaching/learning process centered on the factors that affect science performance (Barchok, 2006; Changeiywo, 2000) and gender differences in science learning (Twoli, 1986). None of these studies sought to find out how gender affects students' achievement on a threshold concept such as the Mole. In an attempt to fill this gap, this study investigated gender differences in learning outcomes on the mole concept.

Statement of the Problem

For many years now, there seems to be a trend in the performance of girls and boys in secondary school chemistry where girls have not been performing as well as boys (KNEC, 2005-2010). This has led to a swing away from chemistry by most girls. The "mole concept" is an important topic in school chemistry and is applicable in all scientific work that promotes health and living standards of citizens. However, the mole concept appears to be seen by students at this level as one of the most difficult, even though it is very central to the understanding of many concepts, which involve calculations in chemistry as a whole. The topic is generally seen by some students as complicated and uninteresting to study. Teachers also appreciate that the Mole Concept is one of the most difficult topics to teach in the chemistry curriculum. The essence of this research was therefore to bring out detailed information to guide teachers and other stakeholders with regard to the gender related difficulties associated with the Mole Concept.

Theoretical Framework: Gender and Science Learning

Gender is an identifiable student characteristic that might determine or affect their achievement in science (Mwetulundila, 2001). Cheel (1987) argued that while a student's sex is not in itself a determinant of achievement, the differences in achievement between girls and boys, particularly in the physical sciences, is well researched and documented. Kotte (1992) contends that the differential expectations and socialization that boys and girls undergo are responsible for the gender differences in school subjects. Concern over the societal status of women has been in existence for a long time, although the concern over low participation and performance of women in science and mathematics has peaked in recent years (Plucker, 1996).

Gender differences have been noted in a number of national and cross-national research studies (Comber and Keeves, 1973; Kotte, 1992; Postlethwaite and Wiley, 1992). An initial explanation given for these findings, although not by those authors, was that girls were inherently unable to do well on the spatial problems that are present in the learning of chemistry and physics. Gray (1981), for instance, argued that girls' under-achievements in science were due to biological factors. Studies further show that the parts of the brain responsible for processing verbal information and permitting the exchange of information between hemispheres were more highly developed in girls (Kimura, 2005). Girls also demonstrated earlier development in the brain regions responsible for impulse control, and, in general, matured earlier than boys (Viadero, 2006). However, the extent to which these biological differences manifested themselves in behavioural differences and their implications for learning was unknown. However, recent research has dismissed this as an inappropriate explanation, and researchers have focused on cultural or social factors such as attitudes towards science, type of schooling, and the socialization process, as well as structural and institutional factors as being responsible for gender differences in science education.

Research Questions

The research questions examined in this study were:

1. What differences are there in achievement between boys and girls on the Mole Concept?
2. What differences are there in attitudes between boys and girls in chemistry?

Methodology

Research Design

The descriptive survey research design was employed to carry out this study. The aim of the researchers was to record, analyze and interpret the existing conditions without deliberate effort to control the variables. This design also accommodates generalization of findings of the study upon the target population from which only a representative sample was actually studied.

Target Population and Sample

The target population for the study comprised students in all the public secondary schools in Kakamega County, Kenya. Kakamega County is among the 47 counties in Kenya and is the second most populated county after Nairobi. Kakamega County on the contrary is the poorest of the 47 counties despite having an abundance of good rainfall and other resources. The county had a population of 1,660,651 according to the 2009 census figures. The Ministry of Devolution and Planning's report, 'Socio-Economic Atlas of Kenya'- which is based on the 2009 Kenya Population and Housing Census data- says Kakamega contributes 4.8 per cent to national poverty. The county's poverty incidence stands at 49.2 per cent with more than 809,500 of its people living below the poverty line. The county was chosen purposively given the contrasts in economics coupled with low performance in science national exams and proximity for efficient research management.

A stratified sample of thirty (30) public secondary schools was chosen from the three (3) school types in Kenya (boys, girls and mixed) and based on whether the schools were high or low performing from previous national examination results. Simple random sampling technique was used to select the sample of three hundred and eighty four (384) form three students for the study.

Instrumentation

Two instruments were used to collect data for this study. They are:

1. Mole Concept Achievement Test (MCAT)
2. Mole Concept Students' Attitude Scale (MCSAS)

Students were required to respond to a Mole Concept Achievement Test (MCAT). The items were constructed using the process that was adopted on the broad array of questionnaires of the Third International Mathematics and Science Survey (TIMSS) and in Kenya Certificate of Secondary Education (KCSE) past examination papers. The MCAT was used to assess the students' understanding of the mole. It consisted of thirteen numerical problems based on the concept as stated in the chemistry syllabus in Kenya. The areas that were covered in the MCAT included understanding of what the mole is, the mole as a counting unit, relationship between reacting masses and stoichiometry, percent composition and Molar Volumes. The MCAT was also designed to measure three major areas; mathematical abilities, spatial ability and descriptive (chemical concepts). Copies of the questions and the table of specifications were given to the chemistry teachers of the sampled students and an expert in test construction. They were requested to comment on (a) the clarity of the language used in writing the questions, (b) the questions' construct and content validity, and(c) the accuracy of the specimen model answers to the question and weighting of the points scored in the marking scheme.

Students' answers to the questions were categorized, according to the degree of understanding using the Conceptual Profile Inventory (CPI) approach, as Sound Understanding (SU), Partial Understanding (PU), Partial Understanding with Alternative Conceptions (PAC), Specific Alternative Conceptions (SAC) and No Understandings (NU) following the scheme used by Haidar & Abraham (1991) and Chanyah, (2007). The % instances of NU, AC, PU and SU were determined. From these five categories, % SU was used as the measure for students understanding of the topic. The higher the % SU of students, the more it was deemed that students had understood the topic.

The MCSAS had items adapted from the TIMSS. Students were requested to a number of likert type items regarding their attitudes towards chemistry and by extension to the mole in terms of: (a) their interest in chemistry, (b) ease of learning chemistry, (c) career interest in chemistry, (d) beneficial aspects of chemistry, and (e) non-harmful aspects of chemistry. Five response categories were used: Strongly Agree (SA), Agree (A), Not Sure (NS), Disagree (D) and Strongly Disagree (SD). The scoring scheme involved the scoring of a favorable response to an item as '5' and an unfavorable response as '1'. High values indicated a positive or favorable attitude and vice versa. The test retest reliability yielded .720 and .782 coefficients for MCAT and MCSAS respectively.

Method of Data Analysis

The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. The MCAT was analyzed both qualitatively and quantitatively. In the qualitative analysis, the data were analyzed using the Conceptual Profile Inventory (CPI) approach. The student's responses in each question were organized to capture each response in a conceptual evaluation scheme, which was adapted from Haidar and Abraham, (1991) and Chanyah, (2007). The conceptual evaluation scheme is shown in Table 1.

Table 1: Conceptual Evaluation Scheme

	Students Response
Sound Understanding (SU)	The student gives a correct choice and their reason closely approximates to scientifically acceptable conceptions.
Partial Understanding (PU)	The student gives a correct choice and their reason contains part, but not at all, of the information necessary to convey a complete understanding. No incorrect information occurs in the response.
Partial Understanding with Alternative Conception (PAC)	The student gives a correct choice -Their reason contains corrects information, but also indicates alternative conceptions concerning some aspect of the concept -Their reason indicates alternative conceptions -No reason The student gives an incorrect choice -Their reason closely approximates to scientifically acceptable conceptions -Their reason contains part, but not at all, of the information necessary to convey a complete understanding -Their reason contains corrects information, but also indicates alternative conceptions concerning some aspect of the concept
Specific Alternative Conception (SAC)	The student gives an incorrect choice and there reason indicates scientifically unacceptable conceptions (Alternative conceptions)
No Understanding (NU)	-The student gives an incorrect choice and does not show the reason -The student's response consists of "I don't know", the question repeated, "I guess", or blank.

Source: Adapted from Chanyah, 2007

In the quantitative analysis of the MCAT, the number of student responses in each scheme were calculated as a percentage and examined graphically by mean of histograms for each sub-concept. The analysis was validated by four experts; two experienced chemistry teachers, and two chemistry lecturers in the university in which the author was located. The experts also were asked to analyze the interpretation of the MCAT in terms of the Conceptual

Profile Inventory (CPI) developed as described above. Quantitative data from the MCSAS was analysed using SPSS. All the research questions were answered using t-test.

Results

Research Question 1

What differences are there in achievement between boys and girls on the Mole Concept? The overall students understanding on the Mole Concept Achievement Test with respect to gender are shown in Figure 1.

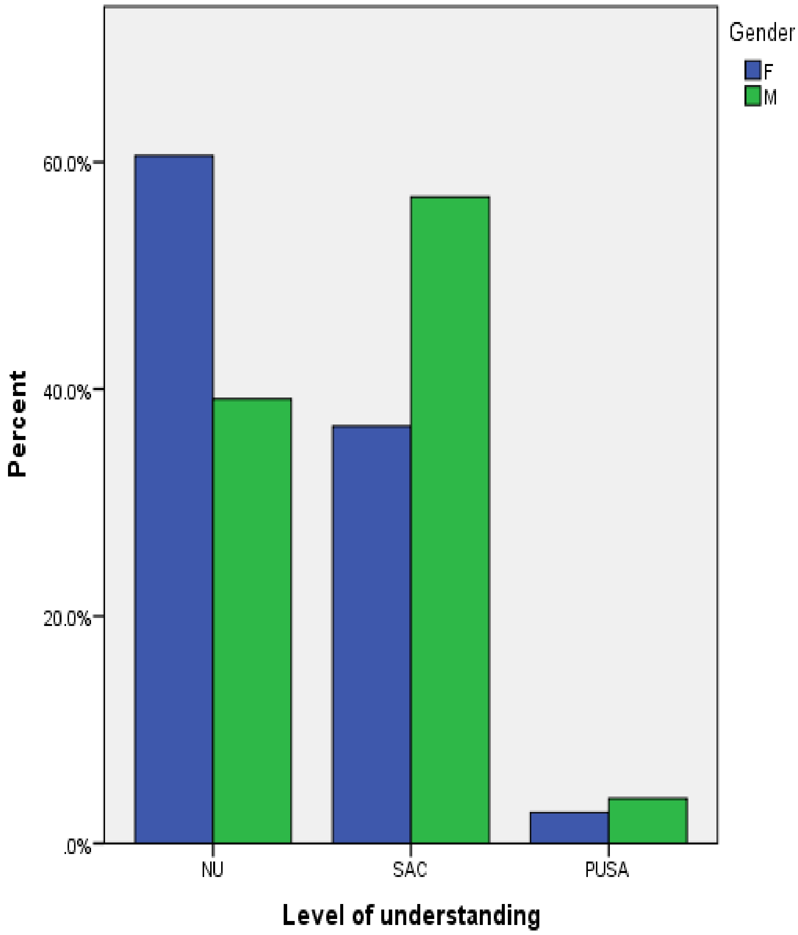


Figure 1: Bar Graph Showing Type of Understanding with Respect to Gender

Over half of the girls held no understanding (NU) of the Mole Concept as compared to 40% of the boys. This could be attributed to the girls having a low motivational orientation towards the topic as compared to the boys. Over half of the boys on the other hand held Specific Alternative Conceptions (SAC) with regard to the Mole. On the overall, both boys and girls had problems with conceptions of the Mole Concept.

Table 2: Differences between Boys and Girls in Mole Concept Achievement

Variable	Gender	N	Mean	Std. Dev	Std Error	df	t	Remarks
Mole Concept Achievement	Male	220	35.50	16.77	0.5172	382	4.409	Significant
	Female	164	27.34	17.52	0.3809			

Table 2 indicates that boys obtained a higher mean score of 35.50 (n= 220) and a standard deviation of 16.77 as compared to the girls who scored a lower mean of 27.34 (n=162) with a standard deviation of 17.52. This shows that in overall, boys' performed better than girls. There was a significant difference between boys and girls in Mole concept achievement ($t = 4.409$, $p<0.05$.

Differences between Boys and Girls in MCAT Performance in the Descriptive, Spatial, and Mathematical abilities

Some key areas which distinguish boys and girls performance are related to their cognitive abilities in mathematical, spatial and descriptive abilities. Differences were therefore computed with respect to gender on the different ability items in the MCAT, (Table 3).

Table 3: Differences between Boys and Girls in MCAT performance in the Descriptive, Spatial and Mathematical abilities

Variable	Whole Sample Mean	Whole Sample SD	Male Mean	Male SD	Female Mean	Female SD	t-value (absolute value)
Descriptive	0.86	1.07	0.88	1.12	0.83	1.00	0.6670
Spatial	1.20	1.32	1.33	1.32	1.02	1.31	4.780*
Mathematical	0.75	1.19	0.84	1.24	0.62	1.10	4.094*
TOTAL	**0.94**	**1.242**	**1.03**	**1.274**	**0.81**	**1.183**	**6.033***

NOTE: * denote significance at 0.05

From Table 3, it can be noted that boys obtained a higher mean score in both mathematical and spatial ability. Boys had a mean score of 1.33 (SD = 1.32) and 0.84 (SD = 1.24) on the spatial and mathematical ability questions respectively. Girls on the other hand had a mean of 1.02 (SD = 1.306) and 0.62 (1.10) respectively for spatial and mathematical ability items. With regard to the descriptive ability items, boys still outperformed the girls with a mean of 0.88 as compared to the girls 0.66.

This contrasts the findings in the First International Science Study (FISS) that documented girls performing better than boys on descriptive ability tasks because of their perceived innate language ability. This finding could be attributed to the girl's negative attitude on the topic, lack of meaningful understanding of the topic and due to the fact that chemistry instruction takes place in the second language which is English. The difference however was not significant

Table 3 also indicates that the absolute t-values for the spatial and mathematical items 4.780 ($p < 0.05$) and 4.094 ($p <0.05$) respectively are highly significant at 0.05 with boys performing significantly higher than girls did on the spatial and mathematical ability tests.

Research Question 2

What differences are there in attitudes between boys and girls in chemistry?

Table 4: Differences between Boys and Girls in Attitude

Variable	Gender	N	Mean	Std. Dev	Std Error	df	t	Remarks
Attitude	Male	220	4.20	0.83	0.0646	382	0.387	Significant
	Female	164	3.96	0.85	0.0630			

Table 4 indicates that boys obtained a higher mean score of 4.20 (n = 220) and a standard deviation of 0.83 as compared to the girls who scored a lower mean of 3.96 (n = 164) with a standard deviation of 0.85. This shows that in overall, boys' performed better than girls. There was a significant difference between boys and girls in Mole concept achievement ($t = 0.387$, $p < 0.05$. It could be expected that the student's primary socialization affected by the socio-economic status might well account for most of the gender differences exhibited with respect to attitudes towards chemistry. On average, boys had a stronger affinity towards chemistry.

Discussion

Consistent with past research, the results reveal that there was a significant difference between gender and students' performance in chemistry. Gender therefore had a remarkably intense effect on Mole concept achievement with gender differences favouring the boys substantially as compared to the girls. This corroborates the findings by Twoli, 1986, Mwetulundila, 2001, Changeiywo, 2000. In addition, there was significant difference in performance with respect to gender among students in descriptive, mathematical and spatial ability areas. The findings of this study strongly agrees with that of Gabel and Sherwood (1984) who concluded that the problem students encounter in the mole concept was as a result of the lack of mathematics content skills involved in the study of this topic. The findings further show that there is a significant difference between male and female students' attitude to science which corroborates Olasehinde and Olatoye (2014) that reported significant difference between male and female students in attitude to science.

Conclusion

The findings in this study show that gender differences do exist in learning outcomes on the mole concept area of chemistry. It is therefore recommended among others that teachers should use instructional strategies that will enhance gender equality in students' learning outcomes in chemistry especially in major concepts like the Mole.

References

Barchok, H. (2013). Effect of collaborative concept mapping teaching strategy on students attitudes towards chemistry in selected schools in Kenya. *Journal of Social Sciences and Humanities*, 2, 530-540.

Cervellati, R., Montuschi, A., Perugini, D., Grimellini-Tomasini, N. & Balandi, B.P. (1982). Investigation of secondary school students' understanding of the mole concept in Italy. *Journal of Chemical Education,* 59, 852-856.

Changeiywo, J.M. (2000). *Students image of science in Kenya. A comparison by gender difference, level of schooling and regional disparities.* Unpublished Ph.D. Thesis, Egerton University, Kenya.

Chanyah, D. (2007). Teaching and learning using conceptual change to promote grade 10 student understanding and numerical problem solving skills in stoichiometry. Unpublished phd thesis. University of Kasetsart.

Cheel, K.S (1987). Curriculum and Achievement in Primary Science. Unpublished MA thesis. School of Education, The Flinders University of South Australia, Adelaide.

Comber, L.C. and Keeves, J.P. (1973**)** Science Education in Nineteen Countries. *International Studies in Evaluation 1*. Almqvist and Wiksell, Stockholm.

First International Science Study. 1973.

Gabel, D. & Sherwood, R.D. (1984). Analyzing Difficulties with Mole Concept Task by Using Familiar Analog Tasks. *Journal of Research in Science Teaching,* 21, 843-851.

Haidar, A.H. & Abraham, M.R. (1991). A Comparison of Applied and Theoretical Knowledge of Concepts Based on the Particulate Nature of Matter. *Journal of Research in Science Teaching,* 28 (10), 919-938.

Inyega, J. O. (2005). A Multi-Site analysis of secondary school chemistry teachers' practices and experiences following Professional development in Kenya. Georgia University, Athens Unpublished PhD thesis.

Keeves, J. P. & Kotte, D. (1991) Sex Differences in Science Education: 1970 to 1984

Kimura, D. (2005). Sex Differences in the Brain. *Scientific American, Battle of the Sexes.* (Exclusive Online Issue 20).

Kolb, D. (1978). The Mole. *Journal of Chemical Education*, 55, 728-732.

Kotte, D. (1992) Gender Differences in Science Achievement in 10 countries, 1970/71 to 1983/84.

Mwetulundila, P. N. (2001). Gender and other Student Level Factors Influencing the Science Achievement of 13- and 14-year-old Australian Students. Unpublished Msc Thesis. Flinders University, South Australia.

Olasehinde, K. & Olatoye, R. (2014). Comparison of Male and Female Senior Secondary School Students' Learning Outcomes in Science in Katsina State, Nigeria. *Mediterranean Journal of Social Sciences*, 5, 517-523.

Plucker, J.A (1996). Secondary Science and Mathematics teachers and gender equity: Attitudes and attempted interventions. *Journal of Research in Science Teaching*, 33(7), 737-751

Postelthwaite, T.N. and Wiley, D.E. (1991**)** Science Achievement in Twenty- Three Countries, Pergamon Press, Oxford.

Republic of Kenya (2007). *The Kenya Vision 2030.* Nairobi: Government printers.

Sheehan, M. (2010). Identification of Difficult Topics in the Teaching and Learning of Chemistry in Irish Schools and the Development of an Intervention Programme to Target some of these Difficulties. UL. PhD thesis

Staver, J.R. & Lumpe, A.T. (1995). Two Investigations of Students' Understanding of the mole concept and its use in problem solving. *Journal of Research in Science Teaching,* 32, 177-193.

Twoli, N.W. (1986) Sex Differences in Science Achievement among secondary school students in Kenya. Flinders University, South Australia, Unpublished ph. D Thesis.

STUDENT, TEACHER AND SCHOOL RELATED VARIABLES AS DETERMINANTS OF CHEMISTRY ACHIEVEMENT IN KENYA: A CASE OF THE MOLE CONCEPT

Nicholas T. Wanjala
Kenyatta University
nicholastwoli@yahoo.com

Janet B. Akala
Masinde Muliro University
akalammust@gmail.com

David W. Khatete
Kenyatta University
dkhatete@yahoo.co.uk

The Mole Concept is a threshold Concept and has often been referred to as an area of troublesome knowledge. The study constructed and tested a model for providing a causal explanation of secondary school achievements in Mole Concept area of chemistry in terms of student variables which emphasized gender, spatial ability, mathematical ability, socio-economic status, attitude; teacher's variables considered as mode of instruction, teaching experience, teaching qualifications, teacher attendance of inset while School variables included resources. A descriptive survey design was adopted for the study. The population was made up of three hundred and eighty four form four secondary school students and their teachers from thirty stratified selected schools. Five sets of instrument were used and these included Chemistry Teachers' Questionnaire (CTQ), Mole Concept Students Attitude Scale (MCSAS), Mole Concept Achievement Test (MCAT), Mole Concept Document Analysis Sheet (MCDAS) and Mole Concept Lesson Observation Schedule (MCLOS). The results showed that 62.30% of the variability in students' achievement in chemistry (X11) was accounted for by all the ten predictor variables when taken together. Recommendations based on the importance of these variables were then highlighted particularly the abilities in Spatial and Mathematical abilities.

Keywords: Student Variables, Teacher Variables, School Variables, Mole Concept

Introduction

Dori and Hameiri, 2005 describe chemistry as an 'enabling science' and a 'gate keeper' to many science areas, meaning that performance in lower level chemistry courses grants or denies access to other science areas. Understanding chemistry requires an understanding of concepts around which the discipline is built, such as the Mole Concept that has been described as a threshold concept and an area of troublesome knowledge (Meyer and Land, 2006). Conversely, most high school students have difficulty with the Mole Concept and considerable amount of research has been done on the topic (Zoller, 1990; Nakhleh, 1992; Ayas & Demirbas, 1997; SMASSE, 1998; Coll & Treagust, 2001; Nicoll, 2001; Sheehan, 2010). Since the inception of a new practical-oriented national science curriculum in all Kenyan public schools in 1984, students' overall understanding of scientific concepts seemed to decline each year as evidenced in their performance in national examinations (Waihenya & Siringi, 2001). Preliminary studies conducted by Kenya's Ministry of Education, Science and Technology indicated that students had difficulties learning, among other topics, the "mole concept" (SMASSE, 1998). Many teachers and students noted that the "mole concept" was one of the most difficult topics to teach or learn in school.

The Mole as a 'Threshold Concept'

Ostwald first introduced the concept of the mole in 1890 when he was seeking the chemical formula of 'oxygenated water.' His 'mole' was: *'The normal or molecular weight of a substance expressed in grams.'* Its meaning has since changed and the IUPAC (International Union of Pure and Applied Chemistry) defines the term as:

> SI base unit for the amount of substance (symbol: ‘mol’). The mole is the amount of substance of a system that contains as many elementary entities as there are atoms in 0.012 kilogram of carbon-12. When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particle. (Furio et al., 2000)

Into the conceptual arena has stepped a new theoretical framework across a wide range of subject areas: *Threshold Concepts and Troublesome Knowledge* (Meyer and Land, 2006, Barradell, 2013). A *Threshold Concept* is a ‘core concept’, a conceptual ‘building block’ that leads to progression in understanding of the subject. Meyer and Land (2006) present seven key characteristics of a threshold concept:

Transformative or seismic: once ‘got’ its effect creates a significant shift in the student view of a subject. Grasping a threshold concept is transformative because it involves an ontological as well as a conceptual shift. We are what we know. New understandings are assimilated into our biography, becoming part of who we are, how we see and how we feel.

Irreversible: once ‘got’ this different view is unlikely to be unlearned. One of the difficulties teachers have is that of retracing the journey back to their own days of ‘innocence’, when understandings of threshold concepts escaped them in the early stages of their own learning.

Integrative: Another characteristic of a threshold concept is that it is integrative in that it exposes the hidden interrelatedness of phenomenon. Mastery of a threshold concept often allows the learner to make connections that were hitherto hidden from view.

Bounded: it affects other new concept areas. A threshold concept is likely to be bounded in that ‘any conceptual space will have terminal frontiers, bordering with thresholds into new conceptual areas’. One important caution is to be aware that a threshold concept can be a form of disciplinary property and as such, its presentation in a curriculum may carry an inherent tendency to invite congealed understandings. This implies a curriculum design perspective that aims for a research-minded approach to mastery in which there is always space for questioning the concept itself. An essentialist reading of threshold concepts is best resisted by sustaining a sense of their provisional explanatory capacity.

Discursive: Meyer and Land, (2006) suggest that the crossing of a threshold will incorporate an enhanced and extended use of language.

Reconstitutive: "Understanding a threshold concept may entail a shift in learner subjectivity, which is implied through the transformative and discursive aspects already noted. Such reconstitution is, perhaps, more likely to be recognized initially by others, and also to take place over time.

Liminality: Meyer and Land (2006) suggest that learning involves the occupation of a liminal space during the process of mastery of a threshold concept. This space is likened to that which adolescents inhabit: - not yet adults; not quite children. It is an unstable space in which the learner may oscillate between old and emergent understandings just as adolescents often move between adult-like and child-like responses to their transitional status. But once a learner enters this liminal space, she is engaged with the project of mastery unlike the learner who remains in a state of pre-liminality in which understandings are at best vague. The idea that learners enter into a liminal state in their attempts to grasp certain concepts in their subjects presents a powerful way of remembering that learning is both affective and cognitive and that it involves identity shifts which can entail troublesome, unsafe journeys. Meyer and Land (2006) have likened the crossing of the pedagogic threshold to a ‘rite of passage’ in which a transitional or liminal space has to be traversed; “in short, there is no simple passage in learning from ‘easy’ to ‘difficult’; mastery of a threshold concept often involves messy journeys back, forth and across conceptual terrain.

The Mole as a Potentially Area of Troublesome Knowledge

Troublesome Knowledge is defined as topics, which are major barriers to learning if not understood: students are able to perform mechanical tasks and techniques, yet fail to understand the underlying concepts and the bigger picture. Students typically show behavior such as:

Ritual knowledge: perform superficial tasks and techniques to get a result but fail to understand the complexity that lies behind it.

Inert knowledge: concepts are understood but not actively used or connected to the 'real world' and so there is a failure to see the 'big picture'.

Conceptually difficult and alien knowledge: concepts are found difficult to grasp due to their counter-intuitive or complex nature.

Troublesome language: problems caused by the type of language used during any teaching e.g. a word can have two meanings and phonetic similarity of terms.

Threshold concepts and troublesome knowledge can cause students to become stuck in an 'in-between state' where they oscillate between their own less sophisticated idea and the understanding required by the teacher. The Mole Concept is a very important topic and failure to understand the concept fully causes difficulties in understanding subsequent topics especially stoichiometry problems including volumetric calculations and concentration of solutions. In view of the importance of the mole Concept and the associated difficulties, teachers need a guide on how to teach this topic. Hence there is the need to carry out a study with a view to determining which of the selected variables will have causal relationship with student achievement in chemistry.

Statement of the Problem

The importance of the mole as a threshold concept which pervades all chemistry cannot be overemphasized. Teachers and students appreciate the topic as one of the most difficult to teach and learn in the secondary school chemistry curriculum. With respect to the factors influencing chemistry achievement, no one particular intervention program has received unequivocal support and, therefore, comprehensive approaches to identifying and finding ways of ameliorating differences in chemistry education are needed. Research must therefore focus on the influence of many variables. It is on the basis of this that the study constructed and tested an eight-variable model for providing a causal explanation of secondary school students' achievement in mole concept area of chemistry. Based on the stated problem the study attempts to provide answers to the following questions.

Objectives of the Study

The study aimed at constructing and testing a model for providing causal explanations of secondary school achievements in chemistry on the mole concept in terms of student variables–gender, spatial ability, mathematical ability, socio-economic status, attitude; teacher variables–mode of instruction, teacher attendance of inset, qualification, teaching experience and school variables–resources adequacy.

Based on the objective, the study attempts to provide answers to the following questions:

1. What is the most meaningful causal model for students' achievement in Mole concept area of secondary school chemistry?
2. To what extent will the 11 independent variables when taken together, predict students achievement in mole concept area of chemistry?

Significance of the Study

This study seeks to identify the influence of school, teacher and student related variables as they relate to the chemistry achievement of secondary school students in Kenya on the Mole concept. By examining all the factors in a causal model, it is possible to obtain an insight into the complex network of social and cultural factors that are responsible for the differences observed in chemistry education. In terms of policy making, the study can contribute to the formulation of further educational policy and strategies for the teaching and learning of the mole concept, as well as the ways in which the Kenyan curriculum can best serve the needs of the various students.

Underlying Theoretical Framework

The focus of the study is hinged on teacher and student; therefore, theories that have to do with the characteristics of both of them as they affect learning would be applicable. The study is based on the theory of curriculum modulation and constructivist theoretical framework (Atwater, 1996). One of the supporting structures of this study is the theory of curriculum modulation which envisions the curriculum naturally changing shape and emphasis as it progresses from its intended form, through implementation by the teacher, to enactment in the classroom setting and subsequent learning by students. Each curriculum domain-intended, implemented, enacted and learned- intersects with the next to form a sequence in which instructional materials, teacher and students are major participants and determinants of the curriculum. Therefore, each classroom, as a unique blend of materials and individuals, produces a complex set of factors that influences learning. This study also supports constructivist's view that learners are actively engaged in making meaning and in the construction of ideas. And this could be said to be affected by variables that have to do with them; these student, teacher and school related variables that are considered in the study.

Research Design

A descriptive survey research design was adopted for the study. This was because there was no manipulation of independent variables.

Procedure

The population for the study was made up of all secondary school form three students and their teachers in Kakamega County, Kenya. A total of three hundred and eighty four students were used in the selected schools. All chemistry teachers in the selected schools took part in the study. The five instruments used for data collection were: (a) Mole Concept Achievement Test for Students (MCAT), (b) Mole Concept Students Attitude Scale (MCSAS), (c) Chemistry Teachers' Questionnaire (CTQ), (d) Mole Concept Document Analysis Sheet (MCDAS) and (e) Mole Concept Lesson Observation Schedule (MCLOS). The administration and collection of all the necessary information were done during the normal class periods with the assistance of the chemistry teachers. Two statistical procedures were employed to analyze the data. These were multiple regression and path analysis. The hypothesized causal model was produced through the linear relationships between the sets of variables involved in the study derived from the three factors that were suggested by Black (1964), Duncan (1966), Bryant and Doran (1977). These were temporal order, previous research and sound theory (theoretical grounds). This causal model is presented in figure 1.

Key
X_1 = Teacher attends In-service Workshops
X_2 = Teacher Qualification
X_3 = Teaching Experience X_4 = Math's Ability
X_5 = Resource Adequacy
X_6 = Spatial Ability
X_7 = Attitude towards chemistry
X_8 = Socio economic status
X_9 = Mode of Instruction
X_{10} = Gender

X_{11} = Achievement in Mole Concept

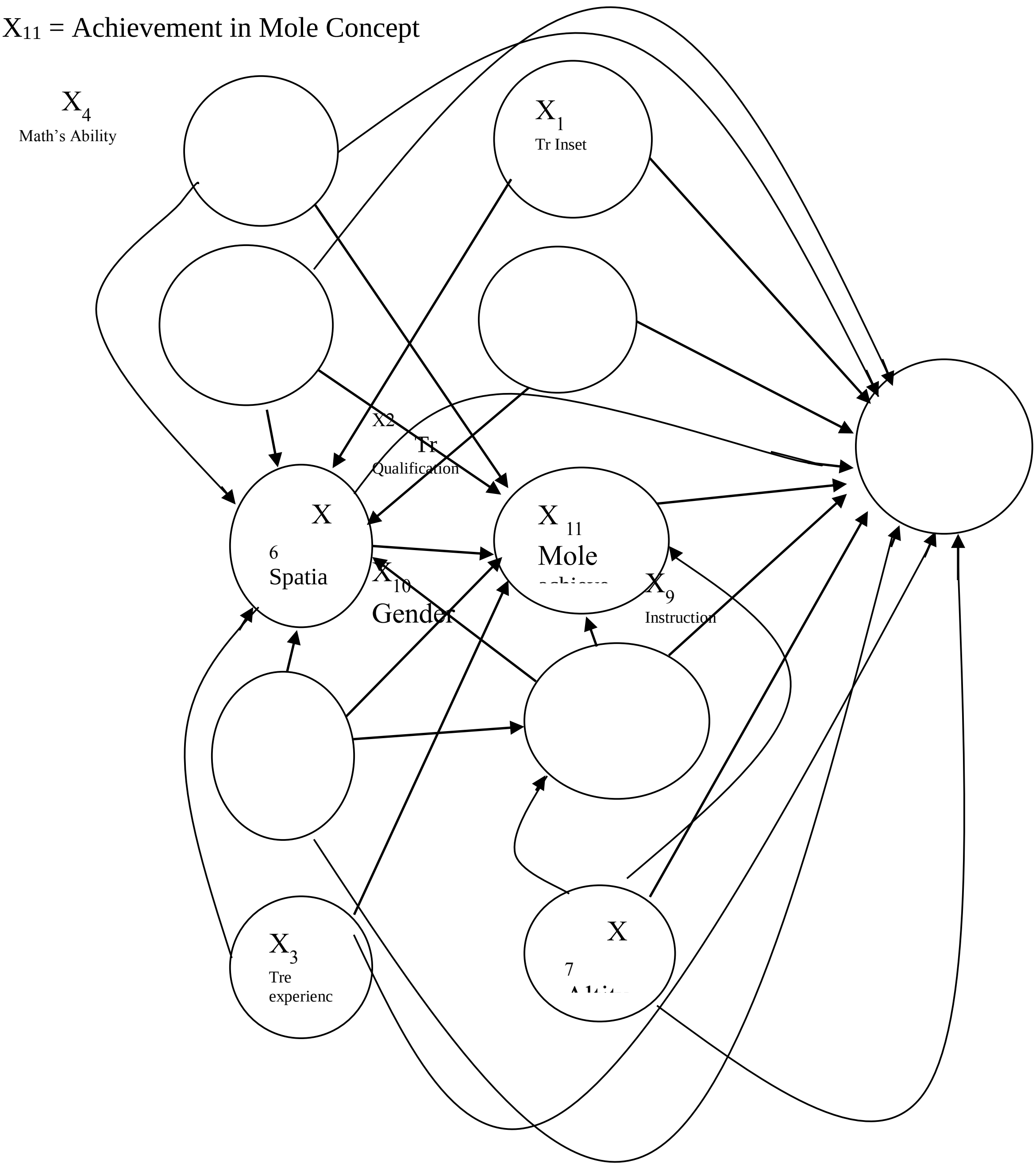


Figure 1: The Hypothesized Model

Hence, the effect of the ten - (10) predictor variables ($X_1 – X_{10}$) on achievement of students in secondary school Mole Concept area of chemistry (X_{11}) was predicted using structural equations which are shown below. In all, the investigators came up with a set of three structural equations after exploring all the hypothetical linkages. The structural equations are labeled (i) - (iii), each equation corresponding to each dependent variable xi (i = 9, 10 and 11)

Structural Equations:

$X_9 = P_{98}X_8 + P_{97}X_7 + P_{96}X_6 + P_{95} X_5 +P_{94}X_4 +P_{93}X_3+ P_{92}X_2+ P_{91}X_1+e_9$

$X_{10} = P_{109}X_9 +P_{108}X_8 +P_{107}X_7 +P_{106}X_6 +P_{105}X_5 +P_{104}X_4 +X_{103}X_3 + X_{102}X_2 + X_{101}X_1+e_{10}$

$X_{11}=P_{1110}X_{10}+P_{119}X_9+P_{118}X_8+P_{117}X_7+P_{116}X_6+P_{115}X_5+P_{114}X_4+P_{113}X_3+P_{112}X_2+P_{111}X_1+e_{11}$

To compute values of the path coefficients (associated beta weights) for the hypothesized causal model, three regression analyses were run.

Results

What is the most meaningful causal model for students' achievement in Mole concept area of secondary school chemistry? Table 1 presents the path coefficients and their levels of significance

Table 1: Path Coefficients and their Level of Significance (Significant at p < 0.05)

Paths	Standard Path Coefficients
$P_{1, 11}$	-0.11*
$P_{1, 12}$	0.39
$P_{1, 13}$	0.48*
$P_{1, 14}$	0.59*
$P_{1, 15}$	0.42*
$P_{1, 16}$	0.56*
$P_{1 ,17}$	0.51*
$P_{1 ,18}$	-0.47
$P_{1, 19}$	0.45*
$P_{1, 10}$	-0.15
$P_{1, 01}$	0.15
$P_{1, 02}$	0.14
$P_{1, 03}$	0.15
$P_{1, 04}$	0.28*
$P_{1, 05}$	0.26
$P_{1,06}$	0.24*
$P_{1, 07}$	0.23*
$P_{1, 08}$	0.21*
$P_{1, 09}$	0.13
$P_{9, 1}$	0.16*
$P_{9, 2}$	0.18
$P_{9, 3}$	0.21*
$P_{9, 4}$	0.16
$P_{9 ,5}$	0.17*
$P_{9, 6}$	0.16
$P_{9, 7}$	0.14
$P_{9, 8}$	0.13

*Significant at $P < 0.05$

From Table 1, it is clear that fourteen (14) out of twenty-seven hypothesized paths are significant at 0.05 levels. These paths survived the trimming exercise and are therefore represented in the parsimonious model. The paths put together in the model resulted in some pathways through which the independent variables caused variations in students' achievement in chemistry. The twenty-seven pathways hypothesized in the model shown in Figure 1 were reproduced to fourteen significant pathways in Figure 2.

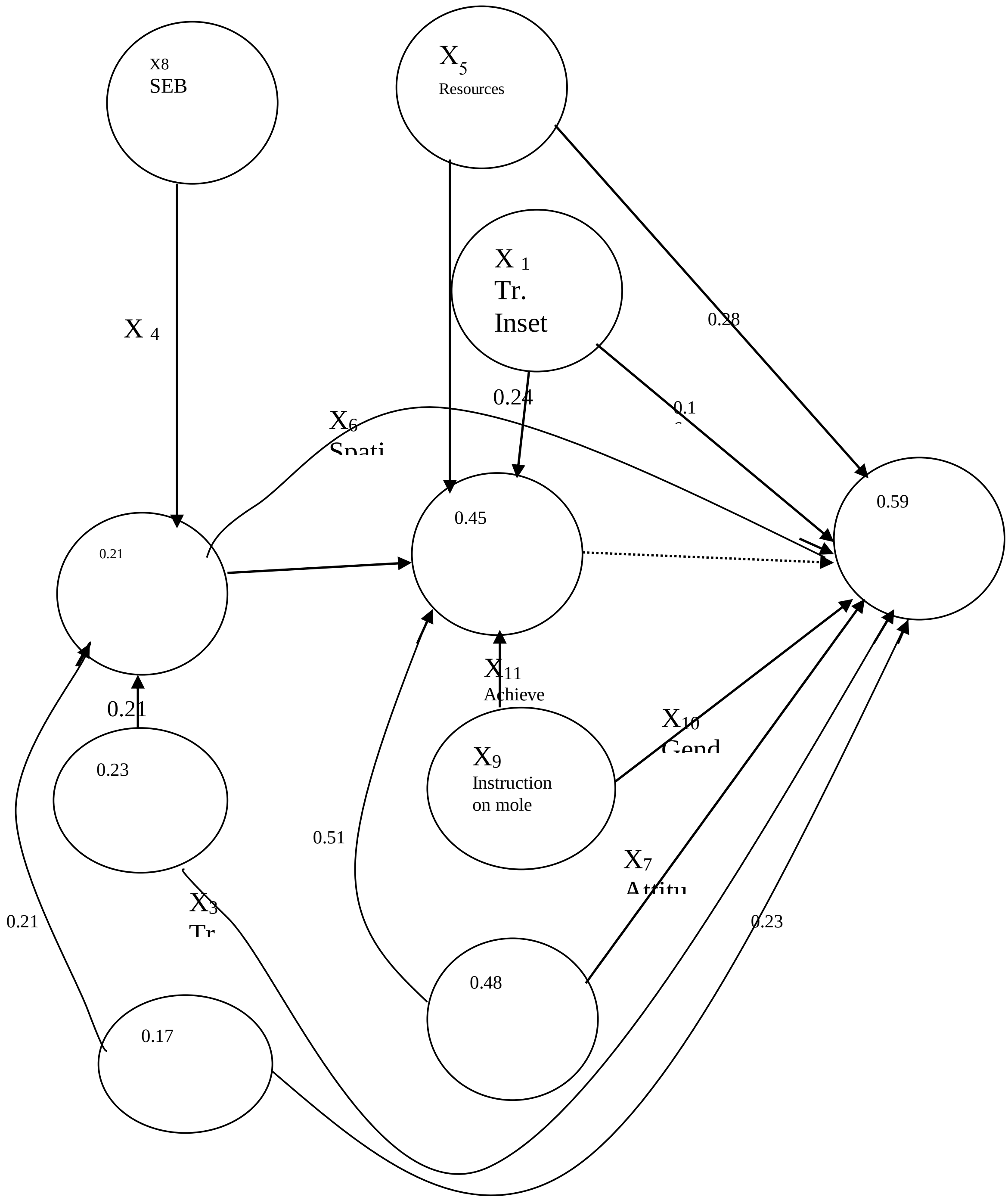


Figure 2: The Parsimonious Model

To what extent will the 11 independent variables when taken together, predict students achievement in mole concept area of chemistry?

Table 2: Composite Effect of the Independent Variables X_I (I = 1, 2, 3 …10) on the Dependent Variable (X_{11})

R	R^2	Adjusted R^2	Standardized error of estimate
.79	.6241	.623	2.5595

In order to determine the most parsimonious causal model R = .79 implies positive multiple correlation among all the ten independent variables and the dependent variable. Adjusted R^2 of 0.623 implies that 62.3% of the total variation in students' achievement was accounted for by the ten independent variables. The remaining 37.7% was either due to error or factors not considered in the study (Table 2).

Discussion

The findings of the study revealed that twenty-seven hypothesized paths were reduced to fourteen significant pathways derived from three structural equations, which were used in explaining the causal model of the student and instructional factors as determinants of achievement in senior secondary school Mole Concept area of chemistry. The efficacy of the new model was verified by reproducing the original matrices of the variables. The original correlation data when verified is consistent with the new model. Hence, the model is retained.

Furthermore, 62.3% of the total variance in students' achievement in chemistry is accounted for by all the ten independent variables when taken together. This figure is very significant in the sense that there are many variables that can cause variance in students' learning outcomes. For the selected ten independent variables among many others, to have accounted for 62.3% of the total variance in the students' academic achievement implies that those ten variables should be given much attention in the teaching and learning of chemistry. The remaining difference (37.7%) in the variance might be due to the influence of other factors not considered in this study.

In addition, only seven variables, Teacher attendance at chemistry workshop (Var. 1) (=-.11), Teaching experience (Var. 3) (= .48), mathematics ability (Var. 4) (= .59), Resources (Var. 5) (= .42), spatial ability (Var. 6) (= .56), Attitude (Var. 7) (= .51) and Mode of instruction (Var. 9) (=.45) have direct causal influences on students' achievement in the Mole Concept area of chemistry. Of the seven variables, mathematical ability (Var. 4) has the highest contribution to students' achievement in chemistry through spatial ability (Var. 6) and students' attitude to chemistry teaching (Var. 7). The finding is in agreement with Adesoji (2008) and Sheehan (2010) who found that mathematical and spatial abilities produced a significant difference in the performance of students in chemistry and by extension to the Mole Concept. Teacher's experience (Var. 3) was also found to significantly affect student achievement. This finding supports the works of Osokoya (1999) who had independently showed that teacher experience predicts students' academic achievement. The reason for this could be explained in the opinion of Hansen (1988) that teachers who have spent more time studying and teaching are more effective. However, this finding is contrary to the work of Adeniji (1999) who found that teacher's length of teaching and administrative experience were not related to students' achievement in science.

A further look at the results of this study shows that variables 9 and 5 (mode of instruction and resource adequacy) also have direct causal influences on students' achievement in chemistry. The findings corroborate those of Wisconsin et al. (1991), Okegbile (1996). The interpretation of this result is that a well-equipped laboratory and availability of textbooks can positively change students' attitude to chemistry teaching, which will in turn enhance students' learning outcomes in chemistry (Var. 11).

Furthermore, the study revealed that other variables like student gender (X_{10}), socioeconomic status (X_8) and teacher qualification (X_2) had very little direct effect on academic achievement in chemistry. Some scholars found student gender to significantly affect achievement in favor of boys (Joseph 1996) while some were in favor of girls (Toh, 1993). Others like, Lagowski (1994) did not see any relationship between student gender and academic achievement. The results of this study did not imply that student gender, socioeconomic status and teacher qualification do not influence achievement at all but in the presence of important factors like mathematical ability, spatial ability, attitude and teaching experience, their effects would be so low that they are not likely to be statistically significant.

Recommendations

After testing of the hypothesized causal model for Mole Concept achievement, the research found that teaching with more emphasis on developing mathematical and spatial cognitive skills is likely to lead to higher motivational orientation and subsequently help learners understand the underlying sub concepts. Therefore, the cognitive ability of students at all levels in the Kenyan classrooms needs to be taken into account. It should not be assumed. Results from this investigation indicate that the cognitive ability of students is central to their understanding and performance on the Mole Concept. Teaching strategies therefore need to take account of the actual cognitive abilities of students and seek to develop their high order cognitive skills.

References

Atwater, M. (1996). Social Constructivism infusion into the Multicultural Science Education Research Agenda. *Journal of research in Science Teaching,* 38, (8), 871-889.

Ayas, A. & Demirbas, A., (1997). Turkish Secondary Students' Conception of Introductory Chemistry Concepts, *Journal of Chemical Education*, 74(5), 518-521.

Adeniji, I. A. 1999. A Path Analytic Study of Some Teacher Characteristics and Teacher Job Performance in Secondary School in Ogun State, Nigeria. Unpublished Ph. D Thesis, University of Ibadan, Ibadan.

Adesoji, F. & Olatuhbosun, S., (2008). Student, Teacher and School environment Factors as Determinants of Achievement in Senior Secondary School Chemistry in Oyo state, Nigeria. *Journal of International Social Research*. 12 (1), 123-140.

Barradell, S. (2013) *The identification of threshold concepts: a review of theoretical complexities and methodological challenges*, Higher Education, 65 (2), 265-276.

Black, H. M.(1964) *Causal Inferences in Non–Experimental Research*. Chapel Hill, University of North Caroline Press.

Dori, Y. J & Hameiri, M. (2003). Multi-dimensional Analysis System for Quantitative Chemistry Problems: Symbol, Macro, Micro and Process Aspect. *Journal of Research in Science Teaching,* 40 (3), 278-302.

Furio C., Azcona R. & Guisasola J. & Ratcliffe M. (2000). Difficulties in Teaching the Concepts of 'Amount of Substance' and 'Mole', *International Journal of Science Education* 22, 1285-1304.

Joseph, E. U. 1996. Gender Differences in Senior Secondary School Chemistry Performance in Akwa – Ibom State. In E. N. Okpara (ed) Gender Issues in Education and Development. A Book of Readings 8: 189-195.

Lagowski, J. I. 1994. Chemistry Problem – Solving Abilities, Gender, Reasoning Level and Computer Simulated Experiments. Paper Presented at the Annual Meeting of the National Association for Research in Science Teaching. Anaheim, C. A., 26-29.

Meyer, F. J., & Land, R. (2006). Overcoming Barriers to Student Understanding: threshold concepts and troublesome knowledge. Routledge-Taylor & Francis Group. London and New York.

Nakhleh,M., (1992). Why Some Students Don't Learn Chemistry: Chemical Misconceptions, *Journal of Chemical Education,* 70(3), 190-192.

Nicoll, G., (2001). A report of Undergraduates' Bonding Alternative Conceptions, *International Journal of Science Education,* 23 (7), 707-730.

Okegbile, S. O. (1996): *Evaluation of Practical Lessons in Science.* Being a paper presented at the Managerial Conference of School of Science Education at the Federal College of Education, Osiele, Abeokuta. 7th -9th May.

Osokoya, M. M. (1999). *Some Determinants of Secondary School Students' Academic Achievement in Chemistry in Oyo State*. Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.

Sheehan, M. (2010). Identification of Difficult Topics in the Teaching and Learning of Chemistry in Irish Schools and the Development of an Intervention Programme to Target some of these Difficulties. UL. PhD thesis.

SMASSE Project 1998 (nd) *Strengthening Mathematics and science in Secondary Education project*: Ministry of Education Science and Technology, Republic of Kenya. [On-line]. Available: http://www.smasse.org

Toh, K. A. 1993. Gender and Practical Tasks. *Science Education Research* 35: 225-265.

Waihenya, K., & Siringi, S. (2001, October 08). Study time: A new report attributes the poor performance in national examinations to inadequate preparation and failure to read questions carefully. Daily Nation. [On-line]. Available: http://www.nationaudio.com/News/DailyNation/Today/

Wisconsin T. Allen & Herlming (1991). *Student/Teacher Ratio.* Tennessee K-3 Class size Study. Mask Ville Tennessee State Department of Education.

DETERMINANTS OF PRE-SCHOOL TEACHERS' USE OF CULTURALLY RELEVANT MATERIALS IN INSTRUCTION: A CASE OF KIENI WEST SUB-COUNTY, KENYA

Joseph K. Waigera
Nyeri DICECE
jkwaigera@gmail.com

Nyakwara Begi
Early Childhood Studies Department
Begi.nyakwara@ku.ac.ke

Culturally relevant education for children has been the focus of education policies in Kenya and in the world. The use of culturally relevant materials in instruction makes teaching-learning process interesting and effective. It also helps in the transmission and preservation of culture. Despite the fact that the National Early Childhood Development and Educational Policy Framework (2006) advocate for culture-based education in formative years, there has been minimal compliance. The utilization of culturally relevant instructional materials requires that teachers, have access to culturally relevant instructional materials, and have positive attitude towards their usage. This paper presents results from a study that was done in Kieni West sub-county in Kenya to establish the extent to which pre-school teachers' used culturally relevant materials in instruction and the factors influencing it. Results from data analysis revealed that most of the instructional materials used in teaching were culturally relevant but inadequate; the difference in use of culturally relevant instructional materials between public and private pre-primary schools was not significant; and the relationship between pre-school teachers' use of culturally relevant materials, availability of culturally relevant materials, and attitudes towards the materials was significant. To improve the use of culturally relevant instructional materials in pre-schools, the Ministry of Education, Science and Technology and other key stakeholders should ensure that culturally relevant instructional materials are available in pre-schools.

Keywords: Culturally Relevant Materials; Instruction; Pre-School Teachers; Determinants

Introduction

Culturally relevant instructional materials make teaching-learning interesting and effective. Shankar (1980) states that instructional materials which are culturally relevant help teachers to make teaching-learning meaningful and interesting to learners. The instructional materials also motivate children to learn and help them to understand what is being taught (Anini, 2011). Antwi-Safee (1997) also maintains that instructional materials, which are culturally relevant appeal to the child's natural curiosities, desire to explore, and experiment.

Use of culturally relevant instructional materials transmits and preserves culture. Reyhner, Gilbert, & Lockard (2011) assert that when children are taught using culturally relevant instructional materials, learning is from the perspective of their culture which helps in preservation and transmission of culture. Sonia (1996) also adds that education, which is based on a child's culture, makes learning relevant, meaningful and real to the learner. Culturally relevant instructional materials help children to appreciate their culture as they have community aspect familiar to the children (Ebrahim, 2003). Marines & Ortiz de Montellano (1993) also emphasize that culturally relevant materials allow learners to learn from a familiar cultural base and develops understanding of their culture. They further remark that when materials are culturally relevant, learners are able to connect new knowledge to their own experiences and develop their self-identity. Battle (1997) also concurs that through culturally relevant materials, learners are able to build self-esteem of learning their culture. Sachdera (1996) reveals that children should be taught using culturally relevant instructional materials in order to preserve and transmit culture.

Culturally relevant instructional materials are materials obtained from the community of the child and have local content. Culture is the way of life and it includes material and non-material things like clothes, furniture, foods, and houses. According to Shankar (1980) instructional materials refer to objects or devices that help the teacher to make learning meaningful to learners. Culturally relevant pedagogy requires that the communities' rich and diverse resources be utilized to make learning more meaningful to the child since they are familiar to them and are readily available.

Culturally relevant education for children has been the focus of education policies in Kenya and in the world. According to Sessional paper no.1 of 2005 one of the goals of education in Kenya is to promote respect for and development of Kenya's rich and varied cultures. When children are learning using culturally relevant instructional materials it helps them to appreciate their culture and promotes a smooth transition from home to school. In Kenya the Commission of Inquiry into the Education System (1999) had found that there was a lot of foreign content in learning materials used for instruction in pre-schools. The Commission had recommended that there was need to make learning more culturally relevant. Antwi-Safee (1997) observes that instructional materials for children should appeal to the child's natural curiosities and desire to explore and should not contain foreign content.

Despite the fact that the National Early Childhood Development and Education (ECDE) Policy Framework (2006) advocate for culture-based education in formative years, there was minimal compliance. Gachathi Committee (1976) that was formed to evaluate the system of education in Kenya had found that a lot of the teaching-learning materials used in pre-schools were foreign in concept and content. The committee had also found that vernacular languages were not used as a medium of instruction in pre-schools due to shortage of culturally relevant instructional materials. The committee had recommended that the government should ensure that culturally relevant instructional materials are used in pre-schools. Several years later the Commission of Inquiry into the Education System of Kenya (1999) had found that what was recommended by the Gachathi Committee had not been fully implemented. The Commission had also found that instructional materials were made from imported materials and contained foreign content. The commission had recommended that the Ministry of Education should sponsor the production of culturally relevant instructional materials.

The study conducted in Kieni West Sub-county was to determine whether the instructional materials used by pre-school teachers were culturally relevant as was recommended by the commission and National ECDE policy framework (2006). The utilization of culturally relevant instructional materials requires that culturally relevant instructional materials be available in schools (Ladson-Billings, 1995).

Objectives of the Study

The objectives of the study were:

1. To establish the extent of use of culturally relevant materials in instruction by pre-school teachers in order to provide culturally relevant education.
2. To determine if there is a difference in use of culturally relevant materials in instruction between private and public pre-school teachers.
3. To determine how availability of culturally relevant materials, and teachers' attitude towards culturally relevant materials relate to use of culturally relevant materials in instruction.

Research Hypotheses

The research hypotheses were:

Ha1: There is a difference in the use of culturally relevant materials in instruction between private and public pre-school teachers.

Ha2: There is a relationship between pre-school teachers' use of culturally relevant materials in instruction and availability of culturally relevant materials.
Ha3: There is a relationship between pre-primary schoolteachers' use of culturally relevant materials in instruction and teachers' attitude towards culturally relevant materials.

Methodology

The study employed explorative descriptive survey research design. The dependent variable was use of culturally relevant materials in instruction. The independent variables were; teachers' attitude towards culturally relevant materials and availability of culturally relevant materials. The study was carried out in Kieni-West Sub-county in Kenya. The target population was teachers in 121 pre-schools in the sub-county. Purposive and random sampling techniques were used to select the sample of the study. The sample size consisted of 98 pre-school teachers selected from both private and public pre-schools. Questionnaire and observation schedule were used to collect data on the availability and use of culturally relevant instructional materials.

Results and Discussions

Use of Culturally Relevant Materials in Instruction

To understand the use of culturally relevant instructional materials, the overall mean scores were calculated and results have been presented in Table 1 below.

Table 1: Mean Scores of Use of Culturally Relevant Instructional Materials by Type of School

	Type of school	N	Mean	Std. Deviation	Std. Error Mean
Use of Culturally Relevant instructional Materials	Public	58	1.1946	.16345	.02146
	Private	40	1.1738	.13353	.02111

As shown in Table 1 the mean score of private pre-school teachers' use of culturally relevant materials in instruction was 1.17, while that of public pre-school teachers' was 1.19. The low mean scores imply that the use of culturally relevant instructional materials was low in both public and private pre-schools.

Further analysis was done to find out whether the difference between private and public pre-primary schoolteachers' use of culturally relevant instructional materials was significant. To test the result, the following hypothesis was formulated and tested. *$H_0$1: There is no significant difference in the use of culturally relevant materials in instruction between private and public pre- schoolteachers at alpha value 0.05 level of significance.*

A t-test was used to find out whether the difference in the use of instructional materials in teaching between private and public pre-school teachers' was significant and the results are presented in Table 2 below.

Table 2: Independent Samples t-test for Equality of Means

		t-test for Equality of Means						
		T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Use of Culturally Relevant Materials	Equal variances assumed	-.66	96	.508	-.02176	.03124	-.082	.041
	Equal variances not assumed	-.69	93.2	.492	-.02076	.03011	-.08	.039

Table 2 shows that the difference between the mean scores for private and public pre-schools teachers' use of culturally relevant instructional materials was -0.21 with 0.50 level of significance (2–tailed). The results show that the difference in use of culturally relevant materials in teaching between the two means was not significant at 0.05. The null hypothesis was thus accepted. This means that private and public pre-school teachers were using culturally relevant materials in instruction the same way.

The study findings confirm results of a study done by Mwololo (2009), who found that there was no significant difference in use of visual media between trained and untrained pre-school teachers. A study done by Begi (2007) on use of computers in instruction by pre-school and lower primary school teachers in Nairobi province had also found that there was no significant difference in instructional computer use between pre-primary school and lower primary school teachers.

Relationship between Use of Culturally Relevant Materials in Instruction and Availability of Culturally Relevant Instructional Materials in Pre-Schools

The researcher was interested to find out how the use of culturally relevant materials in instruction was related with the availability of culturally relevant instructional materials. Data from the observation schedule on the availability of culturally relevant instructional materials were analyzed and results are presented in Table 3

Table 3: Availability of Culturally Relevant Materials by Type of School

		Available				Not Available			
Type of school	Activity Areas	CR		NCR		NA		Total	
		Count	%	Count	%	Count	%	Count	%
Private	Language	21	54.0	9	21.8	10	24.2	40	100
	Mathematics	34	85.8	5	12.5	1	1.7	40	100
	Outdoor	33	82.5	6	13.8	2	3.8	40	100
	Science	36	91.2	3	7.6	1	1.3	40	100
	Social Studies	28	69.2	7	17.5	5	13.3	40	100
	Creative	27	68.2	11	27.6	2	4.2	40	100
	Music	33	83.3	2	5.8	4	10.8	40	100
Public	Language	30	51.7	17	29.3	11	19.0	58	100
	Mathematics	47	81.0	6	10.4	5	8.6	58	100
	Outdoor	48	83.5	4	7.0	6	9.6	58	100
	Science	51	87.9	5	8.7	2	3.5	58	100
	Social Studies	36	62.4	15	26.6	6	11.0	58	100

	Creative	41	70.7	14	24.7	3	4.6	58	100
	Music	44	76.4	5	9.2	8	14.4	58	100

Table 3 shows distribution of culturally relevant instructional material used in private and public pre-schools. The distribution was in terms of activity areas. From the table it is evident that most of the materials used in teaching by pre-school teachers were culturally relevant and there was very minimal difference in use of culturally relevant instructional materials between private and public pre-schools. However, there was notable difference in use of culturally relevant instructional materials between some activity areas where for example private pre-schools reported more use in social studies (69%) compared to public schools (62%). In music activities private pre-primary schoolteachers reported more use of culturally relevant instructional materials (83%) than public pre-schools (76%). In language activities private schools reported more use (54%) than public pre-school (51%). Similarly, in mathematics, private pre-schools had slightly higher use (85%) than public (81%). In Science activities, Private pre-schools had a very high use (91%), which was slightly higher than that of public pre-schools (87%). Different results were also observed in creative and outdoor activities where public pre-schools had slightly higher use than private schools. Specifically, public pre-schools had slightly higher use in outdoor activities (83%) as compared to private pre-school (82%); and in creative activities a slightly higher use was reported in public schools (70%) as compared to private (68%).

To understand the relationship between pre-school teachers' use of culturally relevant instructional materials and the availability of culturally relevant instructional materials in pre-schools, the following hypothesis was formulated and tested. *$H_0$2: Pre- schoolteachers' use of culturally relevant materials in instruction is not significantly related to the availability of culturally relevant materials in pre-schools.*

Pearson's correlation coefficient was used to find out whether there was a significant relationship between use of culturally relevant materials in instruction and their availability. The results have been presented in Table 4 below.

Table 4: Pearson Correlation Coefficient between Use of Culturally Relevant Instructional Materials and the Availability of Culturally Relevant Instructional Materials

		Availability of CRIM
Use of Culturally Relevant Materials	Pearson Correlation	.669(**)
	Sig. (2-tailed)	.000
	N	97

As shown in Table 4 the Correlation coefficient between the availability and use of culturally relevant materials was .669, with 0.000 level of significance (2-tailed). The results imply that the relationship between the availability of culturally relevant materials and use of culturally materials in instruction was highly significant. This means that the null hypothesis was rejected and the alternative hypothesis was retained.

A study done by Mwololo (2009) on pre -school teachers' knowledge and attitude towards use of visual media in instruction found that there was a significant relationship between availability of visual instructional media and use of the media in teaching by pre-school teachers. Begi (2007) in a study conducted in Nairobi province on use of computers in instruction by pre-school and lower primary school teachers had also found that the availability of computers was related to the use of computers in instruction.

Relationship between Use of Culturally Relevant Instructional Materials and Attitude towards Culturally Relevant Instructional Materials

Pre-primary schoolteachers' attitude towards culturally relevant instructional materials was also measured and results have been presented in Table 5 below.

Table 5: Mean Scores of Pre-Primary School Teachers' Attitude towards Culturally Relevant Materials

Type of School	N	Minimum	Maximum	Mean
Private	28	1	5	3.66
Public	45	1	5	3.7

Table 5 shows that both private and public pre-school teachers attitude towards culturally relevant instructional materials was positive. To establish the relationship between pre-school teachers' use of culturally relevant materials in instruction and attitude towards culturally relevant instructional materials, the following hypothesis was generated and tested. *$H_0$3: There is no significant relationship between pre-school teachers' use of culturally relevant materials in instruction and teacher's attitude towards culturally relevant materials.*

Pearson's correlation coefficient was used to test whether there was a significant relationship between use of culturally relevant instructional materials and teachers' attitudes towards culturally relevant instructional materials. The results are presented in Table 6 below.

Table 6: Pearson Correlation Coefficient between Use of Culturally Relevant Instructional Materials and attitude towards use of Culturally Relevant Instructional Materials

		Teachers Attitude
Use of Culturally Relevant instructional Materials	Pearson Correlation	.234(*)
	Sig. (2-tailed)	.022
	N	96

Table 6 shows that the correlation coefficient between pre-school teachers' use of culturally relevant instructional materials and teachers' attitude towards culturally relevant instructional materials was .234, while the level of significance was .022. The results imply that pre-school teachers' attitude towards culturally relevant instructional materials was related to use of culturally relevant instructional materials. The null hypothesis was therefore rejected and alternative hypothesis retained. The results imply that attitude towards culturally relevant instructional materials was a very important factor in the use of culturally relevant materials in teaching.

Al-zaidi (2010) in his study on teachers' attitudes towards technology and levels of technology use in classroom found that teachers' attitude had an influence on their level of ICT use in classroom. A similar finding was reported by Albirini (2004) and Isleem (2003) who had found a significant relationship between teachers' attitudes towards computer and the actual use. This indicates that teachers with negative attitudes towards the use of ICT were less likely to contribute effectively to the utilization of ICT for educational purposes. The study findings disconfirms those of Begi (2007) who did a study on pre-school and lower primary teachers computer use and found that despite teachers having positive attitude towards computers only a small percent of the teachers were using computers in teaching.

Summary of Findings

This study established the materials used by pre-school teachers in teaching and determined whether the materials were culturally relevant and the extent to which pre-primary schoolteachers used the materials in teaching. The results had shown that there was no significant difference in the use of culturally relevant instructional materials between public and private pre-schools. The mean difference between private and public pre-primary schoolteachers' use of culturally relevant instructional materials was not significant at 0.05.

The study also explored the relationship between pre-school teachers' use of the instructional materials and the factors that were likely to influence the use of instructional materials in teaching. The factors investigated were availability of culturally relevant materials, and teachers' attitudes towards culturally relevant materials.

The relationship between pre-school teachers' use of culturally relevant instructional materials and availability of culturally relevant instructional materials was highly significant with correlation coefficient of .669 and the level of significance was .000. The relationship between pre-school teachers' use of culturally relevant instructional materials and attitudes towards culturally relevant instructional materials was significant with a correlation coefficient of .234 and the level of significance was .022.

Conclusion

The difference in use of culturally relevant materials between public and private pre-schools was not significant. The common instructional materials available in pre-schools were course books, play costumes, balls, real objects, pictures, charts, strings, shakers, and blocks and were culturally relevant but inadequate. Most of the instructional materials used by teachers in teaching were culturally relevant but inadequate.

The relationship between pre-school teachers' use of culturally relevant materials and availability of culturally relevant materials was highly significant, while the relationship between pre-school teachers' use of culturally relevant materials in instruction and attitudes towards culturally relevant materials was significant.

Recommendations

To improve the use of culturally relevant materials in instruction in pre-schools, the following are the recommendations for the key stakeholders.

1. The Ministry of Education, Science and Technology should provide funds for producing and acquiring culturally relevant materials and ensure that culturally relevant learning materials are produced to promote culturally relevant teaching.
2. The DICECE officers should organize capacity building and sensitization seminars for pre-school teachers and other stakeholders on how to develop and use culturally relevant materials.
3. Teacher training institutions should train teacher trainees on how to develop and use culturally relevant materials in teaching to provide culturally relevant education to children. The institution should also ensure teacher trainees understand the National ECDE policy framework and the need to provide culturally relevant education.

References

Al-Zaidiyeen, N. J. (2011). Teachers' attitudes and levels of technology use in classrooms. Universiti Sains, Malaysia.

Anini. F. (1997). Design and production of instructional materials made with leather for pre-school education in Ghana. (Unpublished M. A. Thesis). KNUST, Kumasi.

Antwi-Safee, R. (1997). Instructional materials for nursery schools in Ghana. (Unpublished M. A. Thesis). KNUST, Kumasi.

Bakr, S. M. (2011). Attitudes of Egyptian teachers towards computers contemporary educational technology. Ministry of Education: Egypt.

Battle, D. E. (1997). *Communication disorders in multicultural populations*. Newton: Butterworth-Heinemann.

Begi, N. (2007). *A comparative study of pre-school and lower primary school teachers' computer technology usage in teaching in Nairobi Province, Kenya.* VDM Verlag.

Ebrahim, M.M. (2003). Domains of a culturally relevant and responsive educational programme. Los Angeles Unified School District. Programme evaluation and research branch planning, assessment and research division. Publication No 178.

Ladson-Billings, G. (1995). But that's just good teaching! The case for culturally relevant pedagogy. *Theory into practice* 34:159-165.

Marines & Montellano. (1993). In: Alvarez, J. G. (2009*). Instructional Use of Culturally Relevant and Highly Visual Material of Fifth Grade English Foreign Language Students in a Colombian Public School.*

Mwololo, J. (2009). Pre-school teachers' knowledge and attitude towards use of visual media in instruction in Kibwezi District, Kenya. (Unpublished M.Ed Thesis). Kenyatta University, Nairobi.

Ogott, G. O., Indoshi, F. C. and Okwara, M. O. (2010). Determination of language materials selected, developed and used in ECE programme. Educational research journal 9:402-409.

Okobia, E. O. (2011). Availability and teachers' use of instructional materials and resources in the implementation of social studies in junior secondary schools in Edo State, Nigeria.

R.O.K. (1999). Report on commission of inquiry into the education system of Kenya.

Rotumoi, J. (2012). *Factors influencing the choice of approaches used by pre-school teachers in Baringo County, Kenya.* (Unpublished M.Ed Thesis). Moi University, Kenya.

Ruthiri, M. K. (2009). Availability, acquisition and utilization of teaching-learning resources of English in primary schools in Buuri Division of Imenti North District, Kenya. (Unpublished M.Ed Thesis). Kenyatta University, Nairobi.

Shankar, M. (1980). *Audio-visual aids for pre-School and primary school children. A training document aids to programming.* UNICEF assistance to education. New York.

INSTRUCTIONAL MEDIA USE IN ENHANCING STUDENTS' LEARNING OF THE ENGLISH LANGUAGE IN BUNGOMA NORTH DISTRICT'S SECONDARY SCHOOLS IN BUNGOMA COUNTY, KENYA

Wamalwa E. Juma
Kenyatta University

Adelheid M. Bwire
Kenyatta University
addiemarie2010@gmail.com

Simon Rukangu
Meru University of Science & Technology
rukangusimon@yahoo.com

This paper summarizes the findings of this qualitative research with regard to teachers of the English language using instructional media to enhance students' learning of English language in Bungoma North district. The study further sought to describe the availability, frequency use of instructional media in the secondary schools in Bungoma North District of Bungoma County and the relationship between the materials' use and learning. Based on John Sweller's Cognitive Load Theory, this study employed the descriptive survey design that sought to establish the instructional media type and their distribution in various secondary schools. The use of such results was used to establish the relationship between the instructional material and learning of English language. Questionnaires and checklist were used as the research instruments. The target population was the 30 secondary schools, 9505 students, 30 teachers and 30 library personnel. From this population a sample of 10 schools, 10 teachers and 10 library personnel were selected and used. The findings showed that not all schools had adequate Instructional Media; and that Instructional Media were not entirely used by teachers in teaching. Inferential results showed a positive relationship of r = 0.547 between Instructional material and enhancement of learning English; and r = 0.502 between use of Charts and students' learning of English language. Practical suggestions and recommendations to teachers of the English language, teachers' trainers as well as curriculum and material developers have been suggested. This is expected to address the perennial poor performance in English in Bungoma North district and generally, in Kenyan secondary schools.

Introduction and Background to the Study

The English language is one of the most widely spoken languages in the world taking the third position after Chinese and Spanish (Barbara, 2005). Due to its international status gained over time, it has gained the status of a world language (Llurda, 2004) it has become a global medium of inter-cultural communication of all the Commonwealth countries. In recognition of this status, English language is considered to be one of the two official languages as promulgated in the Constitution of Kenya 2010, Chapter 2 Article 7 Sub-article 2 with Kiswahili as the second official language in Kenya (Kenyan Constitution, 2010). The English language in particular is used in all forms of official communication, records and transactions. Specifically, it is used in all formal education institutions in Kenya, in government and private offices and parliament. It is therefore the medium of instruction in institutions of learning like schools, colleges and universities (KIE, 2002) amidst generally poor language use and KCSE results in the secondary schools and in Bungoma North district in particular. Any teaching strategy that would probably improve not only the international cultural interactions but also the pedagogic approaches in teaching and learning approaches among educational institutions in Bungoma North District; thus improving their performance in KCSE.

Since 2009, available records (Knec Reports: 2009-2013) show that Bungoma North district secondary schools have had their low KCSE English subject mean score kept fluctuating from 4.130 to 3.674 in 2010, and 3.549 in 2011. Such trend continued albeit some little improvement at 4.816 in 2012 but again dropped to 3.9718 in 2013 in the Kenya Certificate of Secondary Education (KCSE) national examinations in the English subject. The effects of such results vis-à-vis participative teaching approaches go beyond the district to international dynamics. This necessitated designing a systematic this study as a measure to identify issues that may have posed challenges in the teaching and learning of the English language subject in secondary schools using instructional media.

Statement of the Problem

Some key issues that affect the quality of education in teaching and learning of any subject, English language included are curriculum, instructional materials, equipment and teachers, among others (KNEC, 2004). The task of this study was therefore to find out the use of instructional media in teaching had a role in this poor performance. Thus, the main concern of this study was to investigate, identify, and describe the availability of instructional media and language teachers' use of these instructional media to provide information on the relationship between teaching and the use of instructional media for purposes of enhancing students' learning in Bungoma North district. The key research question is: Does the use of instructional media enhance learning?

Methodology

The descriptive survey design was used in this study. The key issues that were considered to be affecting learning and teaching and learning of English language subject in this district included curriculum, instructional materials, equipment and teachers, to collect data by use of questionnaire from students, teachers and library to provide the necessary description on the availability and use of Instructional Media because descriptive data are obtained through the use of questionnaires and observation method (Kothari, 2004).

The study was carried out in Bungoma North district in Bungoma County, Kenya and targeted 30 registered public secondary schools, 350 students, 10 teachers and 10 library personnel. A smaller representative sample of 10 schools; involving 10 teachers, 10 library personnel and 346 students were drawn.

Collected data was coded by assigning numbers to each questionnaire for identification purposes and then classified into categories. The coded data was then be entered into the Statistical Package for Social Sciences (SPSS) program where appropriate and analysed using qualitative techniques to reveal the sampled population's characteristics. The qualitative approach was employed to organize data from the open-ended questions in the questionnaire and checklist that were thematically categorized and subjected to analysis. The quantitative approach, which involved the use of descriptive statistics, was used to present data in frequencies, mean and percentages in order to determine characteristics of the availability and use of instructional media in enhancing the learning of their students.

Results and Discussion

Instructional media are important elements of teaching various subjects in the secondary schools especially for English language. This paper gives a summary of research findings and addresses students and teachers' use of Instructional Media and the availability of such materials in secondary schools in Bungoma North District.

Instructional Media Availability

The first objective of this research was to establish the availability of Instructional Media in secondary schools in Bungoma North District.

Instructional media availability in secondary schools in Bungoma North district. The study sought to establish the different types of materials stored by their libraries or bookstores which yielded the findings as tabulated in Table 1. The table gives the statistics from a checklist on availability of the specific Instructional Media in secondary schools in

Bungoma North district and the findings are discussed as follows. It was established from students that textbooks are the most available teaching and learning resource materials in schools at exceptionally commendable rates. Computers, charts, photocopiers and the duplicating machine follow at fair rates respectively. The very essential materials like the projectors, record player and its accessories are the least available in the schools all at dismal. This reveals an imbalance of the availability of adequate variety of Instructional Media in schools.

The data presented in the table 1 reveals that of the available computers, only 3 quarters are in working condition while less than 2 thirds of the available T.V sets were in working condition. Only half of the available typewriters and slides and well over a third of cassette recorders, radios, textbooks, photocopiers and duplicating machines were in working condition. Just a quarter of the available computer projectors and an eighth of the record players, videotapes, pictures, charts, models, boards, tapes, cameras and hand outs were in working condition. Effective delivery of content by use of every appropriate strategy and resource is of great concern and is worth laying emphasis on (Dick & Carey, 2001). However, teaching without using instructional media by reason of the media not being available may indeed negatively affect students' learning.

Schools with a library. This study sought to ask students to indicate whether their schools had a library or bookstore. The findings are presented in the table 2.

The findings in Table 2 indicate that well above 3 quarters of the students indicated that their school has a library or bookstore. Such facilities provide storage and security of the teaching and learning materials. They also give access and optimized conditions to students to use the materials for purposes of learning. Quite a dismal number of below an eighth showed that their schools do not have a library or bookstore. Such a situation probably makes it difficult for students in those schools to learn optimally. The lack of resources which conforms to views of Buhere (2001), Ryanga (2002) and Okwara (2012) restricts the choice of strategies on the teacher thus impacting negatively on teaching.

Such a situation probably makes it difficult for students in those schools to learn optimally. On the kind of materials available and stored by these libraries and bookstores, the study established that most schools stored textbooks as their most essential teaching material their libraries. The other types of materials were quite dismal for example film projectors and record players, radio cassettes, TV sets and video players. Nearly half had charts, photocopiers and duplicating machines and computers. Very few had models while none had slide projectors.

Instructional media use in teaching the English language. The second objective of this study sought to establish the Instructional Media that teachers of the English language use in teaching and their frequency of use.

Frequency of use of specific instructional media. Students were asked to indicate how frequent their teachers used given materials while teaching the English language in class. Results are presented in the Table 3.

From Table 3, it was established that most teachers use printed materials while about a quarter use visual aids. Very few of them use audios and 3-dimension objects.

The above data show that printed material is the media used most in the Bungoma North district secondary schools. Printed media may include books, charts and hand-outs. Teachers find such material abundantly available because schools prioritize the purchase of such kind of materials over others. Most lesson content is bound in books and charts and as a result, such materials complement and supplement the teachers' practical presence in class. More types of the learning experiences as identified by some scholars (Twoli, et al, 2007) should be exposed to learners other than predominantly relying on books.

Instructional materials most frequently used. The study sought to identify the particular Instructional Materials most frequently used by teachers while teaching the English language. Results are shown in the Table 4. From the table, it was established that most teachers used printed materials while only about a quarter used visual aids. Very few of them use audios and 3-dimension objects. This shows a skewed in the selection of these teaching resources.

The results in table 4 show that textbooks and black walls are the Instructional materials used most often by the teachers of the English language. Charts, hand-outs and radio cassettes are the instructional materials often used while pictures, the OHP, video and T.V are the materials less often used. On the other hand, films are rarely used while slides are not used at all. The over-reliance on textbooks and the black wall denies students the variety of experiences other options of materials would offer to make learning more exciting. Teachers should explore the use of other materials more (Allwright, 1990) to achieve enhanced learning by encouraging the students to engage with knowledge in different ways.

The study also revealed that majority of students stated that their teachers generally use Instructional Media while teaching the English language subject in class. However, on particular types of media, less than a sixth of the students indicated that their teachers use hand-outs and pictures. About a quarter of the students further indicated that their teachers of English use charts while teaching in class as the majority indicated that their teachers use the black wall. Almost none indicated that teachers use radio cassettes, the OHP and films. Students also indicated that teachers never use: video, TV or slides in teaching. Teachers need to give their students adequate experience with different teaching aids for varied experience and enhanced learning if they have to benefit more from the learning experience.

The study also found out that the frequency of use of Instructional media by their teachers was very often at a mean standard error of less than 1 for all materials. However the use varied depending on the type and availability of particular media. Well over four fifths of the students felt that when their teachers of the English language use teaching resources, then their learning is enhanced because they would understand concepts better and this would essentially enhance their learning if indeed teachers practically used the resources.

Relationship between the use of instructional media and learning. The third objective of this study was to establish the relationship between the use of Instructional Media and learning of the English language. Results are as shown in the table 5. From the table it is seen that the use of text books positively influence the learning of English language at $p < .05$, and $r = 0.547$. Taking the coefficient of determinant, textbooks contributes 29.9 % variability in enhancement in the learning of English language. The use of hand-outs positively influence the leaning of English language at $p < .05$ and $r = 0.318$. Taking coefficient of determinant, hand-outs contributes 10.1% variability in the enhancement of English language. Charts as an instructional media positively influenced the learning of English language at $p < .05$ and $r = 0.459$ (equation (2)). Taking coefficient of determinant to be r, the charts contribute 21 % variability in the enhancement of English language. Black wall and radio too influences the learning of English positively at $P < .05$ and $r = .502$ and .389. Taking the coefficient of determinant black wall and radio contributes 25.2 % and 15.1 % variability in the enhancement of English language.

Students were required to state their experiences with regard to their teacher's use of instructional media in class. The study established therefore that most students experienced enhanced learning if teachers used teaching instructional resources. The study further established that resources make over half of the students to understand concepts better and hence perform well.

This study further confirmed the positive effect of enhanced learning that the use of resources makes on students’ learning as also established by Kimui, (1990) as over half of the students felt Instructional materials make them to understand the English language and to perform well. This therefore underscores the role Instructional Media play in enhancing learning hence teachers have to embrace the use of Instructional media in teaching if their students' learning has to be enhanced.

The study therefore showed that overall, instructional material have a positive influence in the learning of English language at 22% in variability of enhancing learning of English language. Other factors not addressed by this study may provide additional positive influence to learning.

Equations

1. ($r = 0.547$, $n = 376$, $p = 0.010$) (See Table 3)
2. ($r = 0.459$, $n = 376$, at $p = 0.05$) (See table 3)
3. ($r = 0.502$, $n = 376$:, at $p = 0.001$) (See table 3)

Tables

Table 1: Specific Instructional Material Available and in Working Condition

Instruction material	Frequency	Percentage
Opaque projector	0	0
Overhead projector	0	0
Slide projector	0	0
Film projector	0	0
Record player	4	12.5
Cassette recorder	11	37.5
Video tape	4	12.5
Pictures	4	12.5
Charts	4	12.5
Models	4	12.5
Boards	4	12.5
Tapes	4	12.5
Slides	15	50
Cameras	4	12.5
Radios	11	37.5
TV	19	62.5
Text books	11	37.5
Hand outs	4	12.5
Photocopy machine	11	37.5
Duplicating machines	11	37.5

Type writers	15	50
Computers	23	75
Computer projector	8	25

Table 2: Schools with Library or Store

Library or store	Frequency	Percentage
Yes	296	85.6
No	18	5.2
Missing	32	9.3
Total	346	100.0

Table 3: Students' Response on how often their Teachers Use Specific Materials

Instructional media	N	Mean		Std. Deviation	Skewness	
	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error
Text books	346	1.3229	.06369	.62399	2.298	.246
Hand-outs	346	2.4706	.21209	.87447	2.008	.550
Pictures	346	2.7500	.30464	1.05529	-.522	.637
Charts	346	2.2963	.19839	1.03086	.938	.448
Black wall	346	1.3864	.08768	.82255	2.213	.257
Radio cassettes	346	2.4000	.74833	1.67332	1.089	.913
Over Head projector	346	3.2000	.66332	1.48324	-.552	.913
Video and TV	346	3.5000	1.5000	2.12132	.	.
Slides	346	5.0000	.	.	.	.
Films	346	4.0000	1.0000	1.41421	.	.

Key: 1- very often, 2-often, 3- less often, 4- rarely, 5- none at all

Table 4: Instructional Materials Most Frequently Used in Teaching English in Schools

Instruction material	Frequency	Percentage
Visual aids	6	20
Audios	3	10
Printed materials	27	90
3Ds objects	3	10

Table 5: Relationship between Instruction Material and Learning of English

Correlation			Enhancement of English language.
Spearman's rho	Use the text books	Correlation Coefficient	.547*
		Sig. (1-tailed)	.010
		N	376
	Use the handouts	Correlation Coefficient	.318
		Sig. (1-tailed)	.007
		N	376
	Use the charts	Correlation Coefficient	.459
		Sig. (1-tailed)	.05
		N	376
	Use the black wall	Correlation Coefficient	.502
		Sig. (1-tailed)	.001
		N	376
	Use the radio.	Correlation Coefficient	.389
		Sig. (1-tailed)	.048
		N	376

Conclusions

The main objective of this study was to investigate the utilization of Instructional Media in enhancing students' learning of the English language. The study was anchored on the Cognitive Load theory by John Sweller (2005). It had a keen interest on: identifying the Instructional resources available in schools for teaching the English language, finding out the frequency to which teachers use Instructional Media while teaching their students and the relationship between the use of Instructional media and learning the English language. The study was important because KCSE performance of Bungoma North district in the English subject has remained below average over the years according to the KNEC reports.

Based on the findings on availability of Instructional Media, it was established students that textbooks are the most available teaching and learning resource in schools at exceptionally commendable rates. Computers, charts, photocopiers and the duplicating machine follow at fair rates respectively. The very essential materials like the projectors, record player and its accessories are the least available in the schools all at dismal levels.

On the adequacy of the learning materials, the study established that apart from textbooks other materials like computers and other print machines and the rest of the very essential materials are not adequate like the hand-outs, pictures models and cameras.

On frequency of use, the study established that generally, students often use the available materials in the library especially printed material like books and charts at a descriptive statistic mean of 1.6804, however visual aids, audios and 3D objects were least used.

On the relationship between use of Instructional Media and learning, the study established most students experienced enhanced learning if teachers used teaching resources. The study further established that resources motivate and make learners to understand concepts better, perform well, and improve their reading, writing and listening skills. Instructional Media also improve their attention and helpful in research and exercises.

The study therefore shows that instruction material in overall have a positive influence in the learning of English language at 22% in variability of enhancing learning of English language. From the above findings, this study disputes Richard E. Clark (2008)'s claims that Media not only fail to influence learning but that also do not directly motivate learning. From the teachers furthermore, the study further established that if resources are available and effectively used, they motivate learners disapproving Clark's claims.

Recommendations

From the conclusions regarding English language teachers' use of Instructional Media in enhancing their students' learning, the following recommendations need to be considered by the English language teachers, teacher trainers, teacher trainees, language scholars and other education stakeholders.

Regular English language teaching workshops need to be organized by the ministry of Education for teachers to equip them with skills of coping with the demands of language teaching particularly in the use of Instructional Media. Teachers should be encouraged by their supervisors to make more use of other types of materials besides textbooks. Internal school inspection mechanisms should be established to ensure that these important materials are integrated in teaching.

Schools should also endeavour to replace the obsolete equipment with more technologically modern equipment. Preparation and use of instructional materials by English language teachers need to be encouraged through the syllabus and teachers' guides.

Suggestions on appropriate instructional materials are missing in the current syllabus and KIE approved class texts. To make this possible, the ministry of Education should provide guidance on procurement of other Instructional Media besides books.

English language teachers should advise their schools on the need of purchasing and availing more and diversified types of Instructional Media. School managers need to purchase diversified English language readers for learners. This will enhance reading, which will promote writing as suggested by Awino (2011) and Buhere (2001).

English lessons need to have an hour where given prescribed media will be used in teaching. The additional lesson should be a double lesson to give more time to allow media set-up and operation. The teachers should creatively select their materials from a variety of available resources. Efforts should be made to prepare resources that can be used over a period of time.

There should be newspapers in the English language which learners should be encouraged to read to enhance their learning of the English language. Cartoons and other pictures could be used to develop various story lines on issues that affect learners and this would bring variety in media and hence enhance learning.

References

Allwright, R. L. (1990). *What do we want teaching materials for*? In R. Rossner and Bolitho, (Eds.), Currents in language teaching. Oxford University Press.

Awino, O. E. (2011). Instructional methods for composition writing in French at secondary school level in Nairobi, Kenya. Nairobi: Unpublished Master's Thesis), Kenyatta University.

Ayot, H.O, and Patel, M.M. (1987). *Instructional Methods*. Nairobi: Kenyatta University.

Barbara, F. G. (2005). Ethnologue, 13th Ed. Summer Institute of Linguistics, Inc.

Buhere K. (2013 August 27) To teach in high school, graduates must resit K.C.S.E. *The Standard* p. 21.

Clark, R. E. (2008) *Media will Never Influence Learning: www.usq.edu.au/.../resource/clark/media.*

Dick, W. and Carey, J.O. (2001). *The Systematic Design of Instruction*. New York: Longman Publishers. Kenyan Constitution, (2010)

Kimui, W. (1990). A study of availability and use of learning and teaching resources in PTCs in Kenya. Nairobi: Unpublished PhD Thesis. Kenyatta University.

Okwara, M.O.(2012) A study of factors related to achievement in written composition among secondary school students in Busia District. Nairobi: Unpublished masters' thesis, Kenyatta University.

Twoli,N. et.al (2007). *Instructional Methods in Education.* Nairobi: KIE.

Ryanga, C.W.A. (2002) Reading and writing: The connection to personal, social and economic development. *International Journal of the school of humanities and social sciences. 2* (1) 106-119.Retrived from Waveney Olembo (ed) Chemchemi.

Sweller, J. (2005). *Implications of Cognitive Load Theory for Multimedia Learning (Ed).* New York: Cambridge University Press.

THE LANGUAGE DEMANDS OF THE KENYA CERTIFICATE OF SECONDARY EDUCATION MATHEMATICS EXAMINATION

Victoria M. Wambua
Syracuse University
vmwambua@syr.edu

Joanna O. Masingila
Syracuse University
jomasing@syr.edu

Zachariah L. Mbasu
African Maths Initiative
zmbasu@yahoo.com

Louise C. Wilkinson
Syracuse University
lwilkin@syr.edu

This paper reports the results of a mixed-methods study of the KCSE mathematics examination, a high-stakes test taken by students upon the completion of secondary education. All the KCSE examinations are administered in English, which is the second language for almost all Kenyan students. The general research question is: Do examinations such as the KCSE mathematics assessment measure knowledge of the content area independent of advanced knowledge of English? The statistical analyses (correlation and regression) revealed that English scores predicted students' mathematics scores. Linguistic analysis of the English language requirements of the test revealed that the test items require a specialized knowledge of English. In this paper we present our analysis and discuss the implications for future research and professional practice.

Keywords: High-Stakes Assessments, Mathematics, Academic Language, Kenya

Introduction

The *Kenya Certificate of Secondary Education (KCSE*) examinations are high-stakes tests taken by students upon the completion of secondary education. These tests determine whether a student will be awarded the certificate of completion of secondary education, entrance to post-secondary education, and admission into competitive courses in Kenya. The *KCSE* examinations are administered in English, which is the second or perhaps third language for almost all Kenyan students. Research shows that for all the content areas assessed by the *KCSE*, Kenyan students perform most poorly in mathematics (Aduda, 2003). Previous research indicates that the knowledge of students for whom the language of assessment and instruction is not the first language, often is underestimated. The focus on this paper is on the relationship between knowledge of English and performance on the *KCSE* mathematics examination. The specific research questions addressed are as follows: (1) Is performance on the *KCSE* mathematics examination related to performance on the English language examination? (2) How can we characterize the English language complexity of the mathematics examination? The findings from this study have the potential to contribute to a broader understanding of the relationship between English language and mathematics learning and assessment in Kenya.

Overview

In Kenya, instruction is delivered in English after standard three (grade three). However, for many students, English proficiency that is sufficient to support both mathematics instruction and valid assessment may be problematic throughout their schooling. To examine these relationships, we conducted an analysis of the *KCSE 2011 Mathematics* and *English* examination scores of a sample of 49,815 students of the 413,492 students who took the examination in that year. The relationship between the predictor variable (English scores) and the outcome variable (mathematics scores) was modeled for these students. To examine the potential source of this association, a detailed linguistic analysis was performed for one test item and the examination instructions.

Background: Education in Kenya

Kenyan national policy asserts an urgent need for becoming "a newly industrializing, middle income country providing high quality life for all its citizens by the year 2030" (Republic of Kenya, 2007). The recently launched development blueprint: the *Kenya Vision 2030,* reflects the national policy. As a result, major reforms in the education system are being implemented. The goal of these new reforms is to produce mathematically and scientifically proficient citizens. One consequence of the implementation is that the results of the *KCSE* are used in selecting students for entry into higher education. That is, students' grades in mathematics and science determine their access to competitive courses of study. The rationale for this policy is the potential of students to contribute meaningfully to the country's economy (Republic of Kenya, 2007).

Kenya emphasizes education for all citizens. Kenya embraces an 8-4-4 system of education, where students enroll in eight years of primary education (elementary), four years of secondary education (high school), and four years of tertiary education (university). Although every child has a right to education in Kenya, the cost of education depends upon the school that a student attends. Consequently schooling is not without costs for students. Entry into secondary level is determined by students' performance on the *Kenya Certificate of Primary Education* (*KCPE*) examination, while entry into the university is determined by performance on the *KCSE* examination.

Kenyan students' performance on the *KCSE* mathematics examination is poor, and this represents a decades long trend. Prior research attributes the poor performance in mathematics to student-related factors, for example, attitude, school-related factors, such as inadequate teaching and learning resources, and teacher-related factors like inappropriate teaching methods (Mbugua, Kibet, Muthaa, & Nkonke, 2012).

Notably absent from past discussions about this finding is the role of English proficiency as a potential source of variability in students' performance on Kenyan high-stakes examinations such as the *KCSE*. English is the language of both instruction and assessment from standard four (grade four) to the completion of university education in Kenya. English language is taught as a compulsory subject together with Kiswahili; both are the official languages in Kenya. Students' usage of their first language (mother tongue) is a punishable offense in some schools. In others, the use of Kiswahili is forbidden. However, teachers are allowed to mix the two languages---code-switch--- between English and Kiswahili while teaching, if they deem it helpful in facilitating students' learning.

High-Stakes Testing in Kenya

In Kenya, high-stakes examinations are given in English, which is not the first language of almost all students. Consequently, questions arise about the linguistic challenges that students encounter while taking these high-stakes examinations. Solano-Flores and Trumbull (2003) note that "assessments often confound language skills of examinees with their academic aptitudes" (p. 3); and they posit that, "the fundamental notion of test validity is that low test scores should not occur because of factors that are irrelevant to the construct an instrument intends to measure" (p. 3). Cuevas (1984) recommended that the primary language of instruction, the student's level of reading proficiency in that language, and the skill measured should all be taken in consideration when interpreting the scores of students from a language minority on mathematics achievement. With reference to the *KCSE,* he following questions arise: (a) Do the test items of the *KCSE* demand both advanced English linguistic and disciplinary knowledge from the students? (b) What English skills are required by these examinations? (c) What linguistic challenges might hinder the students' understanding, and hence their responses to individual test items and their understanding of the instructions for taking the examination?

Academic Language: The Mathematics Register

Each academic discipline requires students to master the ways of thinking and communicating, including the use of the special language, or register, of the discipline (Wilkinson & Silliman, 2008). These academic registers are complex and distinct from “everyday language.” Texts and tests are constructed using the register of the discipline. O’Halloran (2005) has argued that for mathematics: Natural language, symbolism, models, and visual displays are combined for expressing mathematical ideas: this is referenced as the *mathematical register*.

The linguistic complexity of test items may account, at least in part, for the poor performance of Kenyan students on achievement tests, such as the *KCSE*. Some of the linguistic factors that may affect students’ test comprehension include: unfamiliar vocabulary, complex grammatical structures, nominalization, multiple embedded clauses, and passive voice constructions (Abedi & Linquanti, 2014). Additional linguistic challenges inherent in high-stakes mathematics examinations, include: technical vocabulary, prepositions, conjunctions, and pronouns, ellipsis, with-preposition phrases, abstract nouns, lengthy nouns, complex sentences, if-clauses, background knowledge, *having* and *being* verbs, and symbolic representations (Fang, 2006; Schleppegrell, 2007).

Adequate knowledge of academic English is particularly important for those Kenyan students who have not attained full English proficiency. Moschkovich and Scott (2013) identified the language features of written mathematics that present problems for English learners: background knowledge; syntactic, and lexical. Students may not have the background knowledge necessary to interpret the test item correctly. At the lexical level, there can be problems with unfamiliar words, unfamiliar phrases, and unfamiliar connotations of words with multiple meanings. At the syntactic level, challenges for English learners include complex sentences, multiple subordinate clauses, and dense noun phrases and the use of the passive voice without an agent.

To understand the potential linguistic challenges in the *KCSE* mathematics tests in Kenya, we analyzed the 2011 mathematics examination. The examination assesses students’ knowledge of mathematical concepts and their applications. We note, however, that this kind of assessment has been characterized as unreliable, especially among students whose first language is not English (Llabre & Cuevas, 1983). Examinations that emphasize English learners’ knowledge of concepts are more likely to confound their language abilities with academic skills.

Methods

Background Information

Upon completion of the *Kenya Certificate of Secondary Education* (a four-year secondary school course of study) students take the paper and pencil national examination (http://www.elimu.net/Secondary/Kenya/KCSE_Student/Maths/Intro.htm). This examination is given, administered, and scored by the *Kenya National Examination Council* (*KNEC*). Students must have taken at least seven subjects to qualify for the *KCSE* certification. They must have taken three compulsory subjects- English, Kiswahili, and mathematics, at least two science subjects, at least one humanities subject, and at least one of the technical or practical subjects. The full examination assesses students’ knowledge of concepts and their applications. The mathematics examination consists of two sets of 24 test items. The test items were classified independently into various mathematical strands based on the National Council of Teachers of Mathematics [NCTM] (2000) *Principles and Standards for School Mathematics* by Professor Uptegrove (Uptegrove, personal communication) and the first author. Items of the same strand were tallied, and Table 1 summarizes the strands of mathematics assessed by the test, including both the number of test items and percentage of the test designated by each

Table 1: Classification of KCSE 2011 Test Items into Strands Based on NCTM (2000)

Mathematics Strand	Number and Percentage of Test Items
Arithmetic	5 (10%)
Algebra	19 (40%)
Calculus	3 (6%)
Geometry	14 (29%)
Statistics	2 (5%)
Trigonometry	5 (10%)

Data Organization

The *KCSE* test results were drawn from the *KNEC*. The authors acknowledge and appreciate the permission by *KNEC* to use the results for education purposes. The *KNEC* provided the data as a text file, which was transformed for the subsequent analyses reported in this paper. Python programming language and the R statistics package were used to restructure the data into appropriate usable format for analysis (The R Project for Statistical Computing, 2015). The information in this dataset consists of information about: the school code, school random number, school name, and student's gender, aggregate points scored by a student, and letter grades for each subject completed by the students.

The sample analyzed for this study consisted of the examination results from 50,584 students from the Western region of Kenya (12%) of the total 413,492 students who took the *KCSE* examination in 2011. The Western region includes 699 schools. Of the 50,584 students who had registered for the *KCSE* examination in the Western region of Kenya, 22,178 (44%) were female while 28,406 (56%) were male. Of the total 50,584 registered students, 49,815 (98.5%) were scored. A missing subject score or examination malpractice resulted in cancelling the examination eligibility for some students. Consequently, the remaining 769 students did not receive their scores, because they did not provide the required documentation during registration, or they were absent during the exams.

Results

The results are reported in two sections: First, we provide data on the relationship between scores on the mathematics and English examinations. Second we offer an analysis of the instructions for taking the test and provide a detailed linguistic analysis of one test item measuring geometry and arithmetic knowledge: (Question 7 from Paper 1).

Scores for the English Examination and the Mathematics Examination

The following data analyses show how the students performed in various subjects in the Western region of Kenya. Mathematics is characterized by the highest variability, while English shows the lowest variability. The box plots reveal that all the other subjects appear to have a higher median score than mathematics, which is characterized by a non-normal distribution. This analysis illustrates the differences in variation in the subject scores and indicates outliers for mathematics and chemistry. The spread of the scores in the subjects is fairly symmetrical, except for mathematics, as indicated by the relative positions of the medians within the respective boxes.

Table 2: Summary of Students' Scores in Various Subjects

Subject	Mat	Chem	Bio	Eng	Kis	Phy	Geo	His	B/S	Agri	CRE
Mean	3.525	3.972	5.174	5.501	6.287	5.483	5.846	6.014	6.061	6.323	7.109
Median	2	3	5	5	6	5	6	6	6	6	7
SD	3.00	2.552	2.582	2.385	2.468	2.804	2.703	2.483	2.514	2.585	2.437
Skewness	1.379	1.338	0.640	0.279	0.210	0.581	0.325	0.229	0.235	0.111	-0.233
No. of candidates	49815	48781	48617	49815	49815	12698	33719	32693	19251	21849	35182

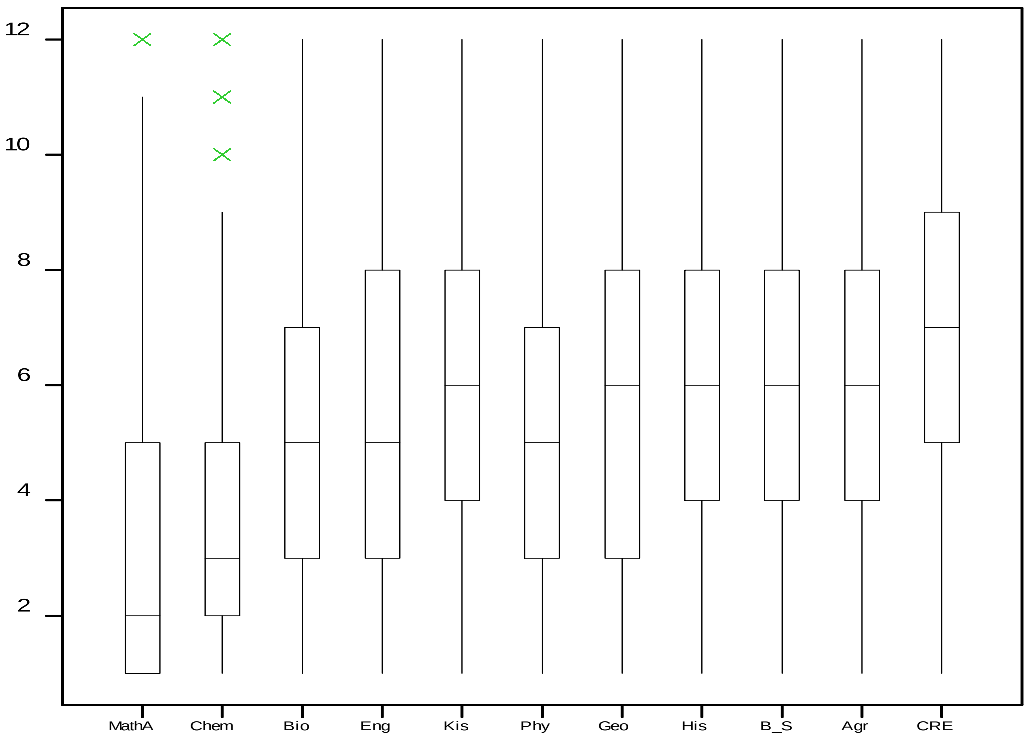


Figure 1: Box Plot Showing the Distribution of Scores in Various Subjects

The Relationship of Scores: English Examinations and Mathematics Examination

One research question concerns whether the mathematics scores are associated with the English scores, and if so: How strong is the association? If these two variables are related, the question arises about potential factors causing that effect. A finding that both subject scores are related is not a sufficient basis for proving causality. Revealing that a correlation exists is the first step in searching for causality. Conversely, if a correlation does not exist between the two subjects, a causal relationship can be ruled out.

We calculated the Spearman Rank order correlation coefficient to examine the relationship between the two variables. The scores for both variables are of ordinal scaling. The rankings of the grades ranged from 1 to 12, with 12 representing the highest score and 1 representing the lowest score. The Spearman's $r_s = .6006$ indicated a fairly strong positive relationship. This test confirmed a relationship between mathematics scores and English scores. This finding suggests that the use of linear regression to examine the relationship for prediction would be appropriate.

Statistical significance. We tested a mathematical model in order to determine the relationship between the English scores (independent variable) and the mathematics scores (dependent variable). We determined that the equation of the regression line for predicting grade point average mathematics scores from English scores was: Mathematics Score = 0.7557 (English Score) – 0.6322.

This equation provides a reasonable and accurate prediction. The amount of variability accounted for was 36.07%. We recognize that there are other variables in addition to English language that might affect one's mathematics score. These may include, for example: the amount of time students spend practicing and studying different aspects and topics in mathematics, motivation to achieve high grades and interest in other subjects, among other factors.

Analysis of the English Language Requirements of the *KCSE* Mathematics Examinations

A second research question concerns factors that may be responsible for the association between mathematics and English achievement on this examination. We examined the overall instructions and one mathematics test item from 2011 *KCSE* mathematics examination. Our goal was to identify the linguistic demands that might hinder students' comprehension and hence their ability to solve the item correctly.

Analysis of the test instructions. The following analysis concerns the written instructions for the examinations. Instructions should be clear and parsimonious. The written language of the instructions should communicate effectively what students have to do to complete the examination. Figure 2 reproduces the instructions for taking the examination.

Paper 1: **Instruction to candidates**

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of the examination in the spaces provided above.
3. This paper consists of ***TWO*** *sections:* ***Section I and Section II****.*
4. Answer ***ALL*** *the questions in* ***Section I*** *and only* ***five*** *questions in* ***Section II****.*
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. ***Show all steps in your calculations, giving your answers at each stage in the spaces below each question****.*
7. Marks may be given for each correct working even if the answer is wrong.
8. ***Non-programmable*** *silent electronic calculators* **and** *KNEC Mathematical tables may be used except when stated otherwise.*
9. ***This paper consists of 19 printed pages****.*
10. ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing****.*

Figure 2: Instructions for the *KCSE* Mathematics Examination

Our analysis addresses Instructions 5, 6, 9, and 10, which may be potentially problematic for students' comprehension:

> *5. All answers and working must be written on the question paper in the spaces provided below each question.*
>
> 6. ***Show all the steps in your calculation, giving your answers at each stage in the spaces below each question****.*

The Instructions should provide a short description of what is meant by *workings.* These may include the use of appropriate substitutions, diagrams, graphs, charts, among other examples. *All answers and working* may be interpreted to mean that the answers are more important than *workings*, that is, the students' written presentation of their calculations---the steps of solving the problem. However, the students' *work* precedes arriving at the answer. Furthermore, students may score points for showing the steps in their calculations. In order to understand the *steps* and *stage,* students first must understand Instruction 6. Moreover, the second part in Instruction 6, *giving your answers at each stage in the spaces below each question*, may be interpreted to mean that there will be more than one answer for each question or for each *stage* (of the *working*). Asking students to show all their *calculations* may constrain students' ability to portray accurately what they know, since there are multiple ways solve the problems.

The following modified version of these two Instructions reduces the complexity (Professor Alston, personal communication)*:

5. Solve each problem and write down your final answer in the space on the question paper.
6. Write down the steps you used to reach your answer in the space on the question paper.

Regarding Instructions 9 and 10:

9. This paper consists of 19 printed pages.
10. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

The question arises whether Instructions 9 and 10 are necessary, as they may distract students from the purpose of the examination.

Analysis of a test item on geometry and arithmetic. The following test item selected from the *KCSE (*Paper 1 Question 7) appears to be designed to measure students' knowledge of arithmetic and geometry:

The external length, width and height of an open rectangular container are 41cm, 21 cm and 15.5 cm respectively. The thickness of the material making the container is 5 mm. If the container has 8 litres of water, calculate the internal height above the water level.

The test item includes aspects of *mathematical register*, such technical vocabulary terms of *length*, *rectangle*, *width*, and *height* and the grammatical feature of dense noun phrases (*an open rectangular*). The technical vocabulary terms define the particular geometric shape referenced in this item. Students would have to know the precise meaning of these words in order to comprehend the problem. Additionally, the item includes derivations (*respectively, container, thickness).* This item includes grammatical structures that are complex and require students to deploy limited cognitive resources to make sense of the problem prior to solving it. Students would have to have the ability to deconstruct this test item according to the syntactic requirements that may complicate processing and their efforts to make sense of the problem. Some of these structures present render the meaning difficult to predict, including long subject nouns (the long pre-modifier in the first sentence: *the external length, width and height of an open rectangular container*) and non-finite clauses (*making the container*). Other aspects tax working memory, such as long distance ellipsis (in the last sentence: *of the container*) (Scott & Koonce, 2014). Finally, the test item employs the use of the conditional (*if*), and a long adverbial phrase with an embedded dense noun phrase (*the internal height above the water level);* both of these are syntactically complex. This analysis is summarized below in Figure 3 (Professor Silliman, personal communication)*.

Linguistic Feature	***Example***
Long Subject Nouns	long pre modifier: *the external length, width and height of an open rectangular container*
Derivations	*respectively, container, thickness*
Conditional, Adverbial Conjunction	*if*
Dense Noun Phrase	*an open rectangular; container thickness of the material making the container; 8 liters of water*; *above the water level*
Non-Finite Clause	*making the container*
Adverbial Modifier with Embedded Dense Noun Phrase	*the internal height above the water level* is an adverbial modifier of the verb but includes a dense noun phrase (*internal height*)
Long Distance Ellipsis	*of the container* is omitted in the last sentence
Technical Vocabulary and Abbreviations	*length, width, height, rectangular, centimeters (cm), millimeters (mm)*

Figure 3: Linguistic Analysis of One Test Item from the KCSE Mathematics Examination: Geometry and Arithmetic

The following modified version of this test item reduces the syntactic complexity and consequently, the burden on students' working memory. This version includes two defining features of the *mathematics register:* Technical vocabulary and dense noun phrases:

An open rectangular container has the following dimensions: Length of 41 centimeters; width of 21 centimeters; and height of 15.5 centimeters. The thickness of the walls of the container is 5 millimeters. A total of 8 litres of water was poured in the container. Find the internal height of the container that remains above the water level.

This analysis suggests that advanced knowledge of English syntax is required by student to understand this test item and the instructions for the examination. Questions about the validity of this test item are considered: (a) does the item measure knowledge of arithmetic and geometry or knowledge of the *mathematics register* and English syntactic complexity? (b) If students can earn points for their *workings* (according to the Instructions), then they should understand that the steps of their problem-solving process must be presented in writing on the test booklet page. The modified version of the item encourages that representation of the students' work.

Summary and Discussion of Findings and Implications for Practice

In this paper we present the analyses of the scores for both mathematics and English. The results indicated that students' English scores predicted their mathematics scores for this sample of 49,815 *KCSE* test-takers. Our subsequent analyses of the mathematics test focused upon the English language requirements of the test items and instructions. The results show that for one test item measuring knowledge of arithmetic and geometry, specialized knowledge of English was required to understand the meaning of the questions posed: (a) general academic and mathematics-specific vocabulary items; (b) a higher frequency of informational words as the means to achieve more concise expression; and (c) complex syntax, which allows embedding of complex ideas into fewer words. These are features of the *mathematics register*. Further examination of the language demands of the *KCSE* may be useful for educators in Kenya and world-wide, as we all seek to answer the questions: (a) What considerations should one make when implementing mathematics examinations in English for students for whom English is not the first language? (b) How should students be prepared for this examination in the English language, both written and oral? (c) How can students best be prepared to demonstrate their knowledge of mathematics on high-stakes tests such as the *KCSE*?

Acknowledgement: The authors express their appreciation to the following individuals who provided constructive commentary on this paper: Alice Alston (Rutgers University); Elaine Silliman (University of South Florida); and Elizabeth Uptegrove (Felician College).

References

Abedi, J., & Linquanti, R. (2014). Issues and opportunities in improving the quality of large scale assessment systems for English language learners. *Understanding language: Language, literacy, and learning in the content areas*. Stanford, CA: Stanford University. Retrieved April 14, 2015: http://ell.stanford.edu/sites/default/files/pdf/academic-papers/07-

Abedi, J., & Lord, C. (2001). The language factor in mathematics tests. *Applied Measurement in Education, 14*(3), 219-234.

Aduda, D. (2003). "*Kenya Certificate of Secondary Education, Examination Results Released by Minister of Education".* Nairobi: Daily Nation, Nairobi: Nation Media Group Ltd.

Cuevas, G. J. (1984). Mathematics learning in English as a second language. *Journal for Research in Mathematics Education*, 134-144.

Fang, Z. (2006). The language demands of science reading in middle school. *International Journal of Science Education*, 491-520.

Kenyan Certificate of Secondary Education (2011). http://elimu.net/Secondary/Kenya/Kenya_Sec.html.

Llabre, M. M., & Cuevas, G. (1983). The effects of test language and mathematical skills assessed on the scores of bilingual Hispanic students. *Journal for Research in Mathematics Education, 14*(5), 318-324.

Mbugua, Z. K., Kibet, K., Muthaa, G. M., & Nkonke, G. R. (2012). Factors contributing to students' poor performance in mathematics at Kenya Certificate of Secondary Education in Kenya: A case of Baringo County, Kenya. *American International Journal of Contemporary Research*, 87-91

Moschkovich, J., & Scott, J. (2013). Linguistic complexity of assessment items. Unpublished report to Smarter Balanced Assessment Consortium.

National Council of Teachers of Mathematics (2000). Principles and standards for school mathematics. Reston, VA: Author.

O'Halloran, K. L. (2005). *Mathematical discourse: Language, symbolism and visual images*. London/New York: Continuum.

Republic of Kenya. (2007). *Kenya Vision 2030: A competitive and prosperous Kenya.* Nairobi: Government printers.

Schleppegrell, M. J. (2007). The linguistic challenges of mathematics teaching and learning: A research review. *Reading and Writing Quarterly*, 23, 139-159.

Scott, C. M., & Koonce, N. M. (2014). Syntactic contributions to literacy learning (295-312). In Silliman E., Stone A., Wallach G. (Eds.), *Handbook of language and literacy: Development and disorders.* New York, NY: Guilford.

Solano-Flores, G., & Trumbull, E. (2003). Examining language in context: The need for new research and practice paradigms in the testing of English-language learners. *Educational Researcher*, *32*, 2, 3-13.

The R Project for Statistical Computing. (2015, April 16). Retrieved from http://www.r-project.org/

Uptegrove, E. (personal communication, March 2015). Mathematics strands in the *KCSE*.

Wilkinson, L. C., & Silliman, E. R. (2008). Academic language proficiency and literacy instruction in urban settings (121-142). In L. Wilkinson, L. Morrow, & V. Chou (Eds.), *Improving literacy achievement in urban schools: Critical elements in teacher preparation.* Newark, DL: International Reading Association.

PHYSICS CLASSROOM DISCOURSE FAVORS BOYS MORE THAN GIRLS: A MYTH OR REALITY?

Joseph M. Wambua
Kenya Institute of Curriculum Development

Nicholas W. Twoli
Kenyatta University
nicholastwoli@yahoo.com

John N. Maundu
Kenyatta University
maundujohn52@yahoo.com

Mode of instruction used in teaching is key to the understanding of the concepts and skills to be learned. Instruction in classrooms is controlled to a larger extend by the interaction patterns involving teachers, learners and resources. Some interaction patterns seem to promote learning especially science subjects. In Kenya, enrolment and performance of girls in Physics has been comparatively low for a long period of time when compared to their male counterparts. This concern was one of the objectives that prompted a study on interactions in Physics lessons with the aim of determining the common patterns that can aid in drawing possible inferences on the effects of instruction in Physics. The study was descriptive in nature and five schools in Matungulu district (Kenya) were used. The main instrument was modified Flanders' Interaction Analysis Categories (FIAC) that was used in Physics lessons. Data was analyzed using ratios, percentages and chi-square. It was observed that there exists a significant difference in the teachers' verbal behavior patterns in the boys' and girls' schools. Teachers in girls' schools used patterns related to 'direct' methods that created autocratic climate in class and hence limited participation in girls during lessons. On the other hand, patterns in the boys' schools related to 'indirect' methods which encouraged boys to ask questions and interact with resources more, thus creating a more democratic learning climate. It is therefore important for teachers to give equal attention during classroom discourse in Physics to both boys and girls.

List of Acronyms and Abbreviations Used

ICT - Information Communication and Technology
IT - Information Technology
K.C.P.E - Kenya Certificate of Primary Education
K.C.S.E - Kenya Certificate of Secondary Education
K.N.E.C - Kenya National Examinations Council
MoE - Ministry of Education
NEPAD - New Partnerships for Africa's Development
PDSI - Plan, Do, See Improve
SMASSE - Strengthening Mathematics and Science in secondary education
F.I.A.C - Flanders' Interaction Analysis Categories

Definitions of Terms Used

Active Participation: Overt or observable involvement in a learning activity
Communication: The sharing of thoughts and feelings through words or symbols that have approximately the same meaning for all involved
Classroom Climate: The atmosphere and environment in which students and teachers work and relate to one another
Direct teaching: A direct instructional strategy best suitable for method memorizing basic information and mastering of well-defined performance skills. It emphasizes systematic organization using small steps, checking for understanding and ensuring active learner participation and learner success
E-learning: Electronic learning

Gender: Social construction of roles, responsibilities and behavior patterns assigned to men and women, boys and girls in a given society in time

Indirect teaching: A learner centered 'open approach' to method education that facilitates practice of a range of skills and encourages learners to take responsibility for the enquiry process

Instructional behavior: These are acts by the teacher, which occur in the context of classroom interaction. They are basically teaching behaviors

I/D Ratio: The ratio of in-direct instructional behavior to direct instructional behavior

Learning: Acquisition of knowledge, skills and attitudes that results in observable change in behavior or capability

Learning Strategies: These are the instrumental strategies; specific methods of promoting learners achievement of planned learning goals

Rhetoric questions: Questions asked for rhetorical effect, and not to elicit a response

Sex: Biological differentiation between women and men

Verbal interaction: What teachers and pupils say to each other, who does the talking and about what, who asks questions and who responds

Background

In most African communities and Kenya in particular, division of labour is determined by the society. Performance of different roles in the society is assigned to members of different sex by the community. The roles to be played by either sex vary from one community to another though anything related to technology is seen as a preserve of men. Due to this, men are perceived to be better placed to study science related careers and women are left to study art – related courses. This has gone a long way and it has affected the choice of subjects to study at high school level. It has also led to dismal performance and low enrolment for girls in science related subjects and in particular Physics. This is supported by the data in table 1.

Table 1: K.C.S.E Physics Performance and its National Candidature (Boys and Girls) in Kenya From 2001-2005

Year	Girls entry	Girls Mean	Boys Entry	Boys Mean	Total Entry	% of Girls	% of Boys
2001	16,210	38.36	38,388	38.62	54,598	29.7	70.3
2002	15,283	42.18	38,793	44.51	54,076	28.3	71.7
2003	16,094	42.69	40,386	44.39	56,480	28.5	71.5
2004	16,975	46.95	43,107	51.50	60,082	28.3	71.7
2005	19,290	48.64	50,145	54.77	69,435	27.8	72.2

Source: Kenya National Examinations Council (KNEC)

Introduction

Kenya aspires to be industrialized by the year 2030. Use of proper teaching methods might be one of the ways of helping Kenyans to achieve this goal. These proper methods of teaching (indirect methods) should are characterized by a move from the 'traditional methods of teaching' like the formal lecture method to the modern ways of teaching like role playing which ensure almost total involvement of the learner in the teaching- learning process for both boys and girls.

It is worth noting that development cannot be attained without engaging women at all levels of governance. For women to be involved, they have to be empowered. One of the most appropriate tools for empowering them is education. Industrialization is attained faster when the human resource is well endowed with scientific skills. Most of these scientific skills are acquired through proper teaching of Science subjects at all levels of education. Physics is one of the vital subjects which industrialization heavily relies on. With this in mind, women in Kenya ought to be taught the same way as their male counterparts to ensure that they are equally endowed with the required scientific skills relevant for the job market.

Purpose of the Study

The purpose of this study was to determine the verbal interaction patterns which exist in Physics classrooms. The study was also to establish whether there exists any significant difference in verbal interaction patterns in mixed, girls and boys schools.

Objectives of the Study

This study was guided by the following objectives:

1. To find out the kind of classroom atmosphere created by the teacher’s verbal interaction patterns
2. To find out which between the direct and the indirect methods of teaching elicits most responses from the learner
3. To find out whether there is any significant difference in classroom verbal interaction patterns among mixed, girls’ and boys’ schools.

Research Questions

The research was guided by the following pertinent questions:

1. What type of teacher-pupil interaction patterns exists in a Physics classroom?
2. Are there any significant differences in classroom interaction patterns in the teaching of Physics in mixed, girls’ and boys’ schools?

Studies Done on Classroom Discourse

According to Sotto (1995) the way the teacher communicates is an important issue. As a result, one of the topics commonly taught in teacher training courses is classroom communication and more so the verbal communication. Verbal behaviour has some advantages when used in analyzing classroom interaction in that it is easy to observe and note whatever is happening. An observation checklist is required for this purpose.

Pollard (2005) suggests that classroom interaction which involves communication helps us to make best use of time and also to answer some pertinent questions to teaching and learning. Some of the questions include; how effective is teaching by telling and can it be done better? How good are we at asking questions? How can we make class discussions better?

Innovations have been done worldwide in an attempt to increase verbal interactions in the classroom. According to Draper (2002) electronic equipment for interaction in lecture halls has been designed in the United Kingdom. Using this device, classroom interaction is electronically enhanced. Verbal interaction takes a greater percentage as compared to other forms of interaction while the teaching- learning process is in progress. Verbal interaction here refers to what the teachers and the pupils say to each other, who does the talking and about what, who asks questions and who responds.

Pollard (2005) observes that verbal communication is and will always be at the heart of teaching. Researchers have shown that teachers do much of the speaking that takes place in the classroom (ibid: 262). Flanders (1970) carried out a research in America and found out that in the teaching sessions observed, two-thirds of the time was spent in a talk and the teacher did two-thirds of that talking. The picture was a predominantly teacher dominated situation.

Muthwii (1981) researched on verbal interactions in Chemistry classrooms and found out that in Kenyan classes eighty percent (80%) of the total time is spent on lecturing by the teacher. Learner-centered and interactive methods of teaching lead to effective teaching and learning. He recommended that there is need to involve the learners fully while teaching.

Njuguna (2000) studied verbal interaction patterns in some selected secondary school Home-science teachers with their students in Nairobi province and found out that there exists a significant difference in the direct teaching behaviour patterns of Home-science teachers in girls', boys' and mixed schools.

Methodology Used

The descriptive survey research design was used for this study since observations on verbal interactions taking place in Physics classrooms were to be made. The nineteen public secondary schools in the district were categorized into three strata namely; girls' schools, boys' schools and mixed schools. Boys' schools are only two and both were picked using purposive sampling. There are four girls' schools and the names of these four were written on small pieces of paper; each school on its own piece of paper. Later, each piece was folded keenly to hide the identity of the school. The four pieces were shuffled and the researcher then picked two papers and included the schools written on them in his sample. For the thirteen mixed schools, which are all district schools, the procedure similar to the one followed in choosing the two girls' schools was followed and the researcher got two more schools, which were included in the sample. By the end of this process, the researcher had obtained a total of six schools for the sample. Piloting was done to validate and ensure that the instruments were reliable. When carrying out the main study, one of the sampled schools declined and this left the researcher with five schools where the study was carried out. Data was collected using observation schedules and interview guides. The collected data was analyzed and discussed. The chi-square was used in making comparisons of the verbal interactions, which took place among mixed, girls' and boys' schools. I/d ratios were used to determine the extent to which the teacher was using the indirect and the direct methods of teaching. Out of the discussions, conclusions and recommendations were made.

Findings

On the use of direct methods of teaching and the indirect methods, the i/d ratios revealed that teachers in the sampled girls' schools use mostly direct methods of teaching. The i/d ratio for boys and mixed schools in this sample are comparatively higher showing that teachers in these types of schools use the indirect methods relatively more compared to the teachers in girls' schools.

The researcher also found that there was a relatively higher use of categories 5a, 5b and 5c as compared to the other categories. This observation was cutting across all categories of schools (boys', girls' and mixed schools). Physics is a practical subject and instead of using lecture method while teaching, heuristic methods should be used because they foster creativity and discovery of new theories, laws and principles. By doing this, the students will get ample time to participate in the lesson and increase their initiation during the lesson.

Generally, there was a relatively low use of categories 1, 2, 3 and 4. Girls' schools were the most affected by this. This may mean that, teachers teaching in girls' schools rarely reinforce their learners. They also appear to be weak in building on the learner's ideas. This de-motivates the learners and reduces their participation in the lesson and hence reducing their initiation. Teachers in boys' and mixed schools made a relatively higher use of these four categories.

High use of categories 6, 7, 5a, 5b and 5c is more likely to create an autocratic climate in the classroom. With this kind of climate in classroom, students are not free to participate in the teaching- learning process. This hinders their creativity and reduces the chances of discovering new things. High use of categories 1, 2, 3 and 4 leads to the creation of a democratic climate in the classroom where students are free to participate during the teaching-learning process.

Discussion and Analysis of Data

This section discusses the findings and does some analysis of the data obtained from the study.

General comments on verbal classroom interaction of physics teachers in girls', boys' and mixed schools. In all categories of schools, category 5a was the most dominant. Teachers whether males or females were using lecture method most of the time. This means that the teachers were teaching physics theoretically. In most cases, category 9 (student talk initiation) was having a high percentage when there was a high percentage in category 2 (reinforcing). Students participated more when the teachers were reinforcing them. From the tables 4.05, 4.06 and 4.07, the bar graph below shows that category 9 has a high percentage when category 2 has a high percentage and vice- versa. Figure 1 shows the comparison between categories 2 and 9.

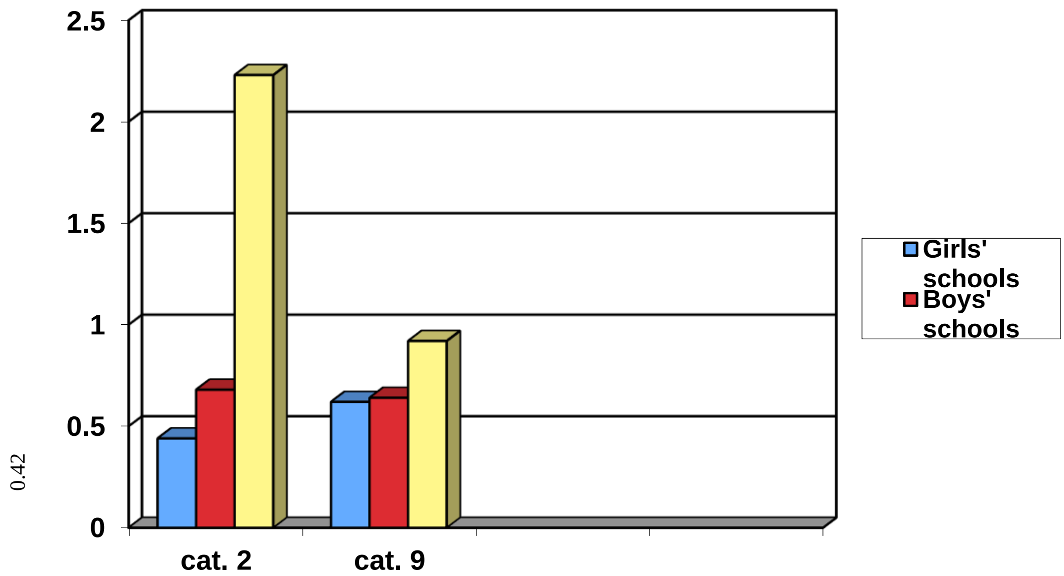
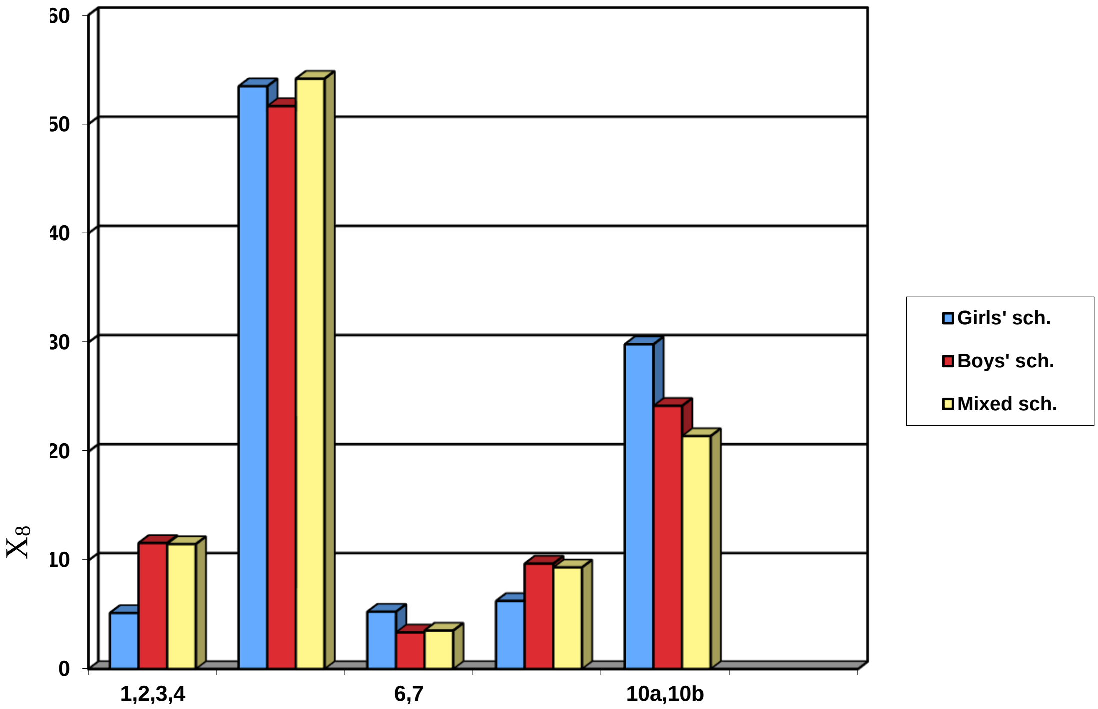


Figure 1: A bar graph giving a comparison in percentages between categories 2 and 9
(Refer to Appendix I on Modified FIAC)

From the bar graph above, the data represented shows that reinforcement is proportional to the level of students'- talk-initiation.

In Girls' schools, reinforcement is at the minimum level followed by Boys' schools and lastly mixed schools. Teachers teaching in Girls' schools do not motivate their learners as teachers teaching in mixed schools.

Figure 2 shows comparison of the percentages of tallies of the teachers and students verbal interactions for different categories across the three categories of schools.



Modified FIAC categories

Figure 2: A Bar Graph Showing the Verbal Classroom Interaction Patterns of Teachers in Boys', Girls and Mixed Schools Expressed in Percentages

The bar graph above is used to show the general outlook of the verbal classroom interaction patterns. The categories which fall under the indirect influence by the teacher while teaching the students that is categories 1, 2, 3 and 4 have been grouped together for easier comparison of indirect and direct methods of teaching.

Percentages of categories 5a, 5b, and 5c have been summed up together to show the extent to which lecture method has been used. Categories 6 and 7 have been added up for matters of plotting since their percentages are relatively small. They also show the use of directions given to the learner from the teacher. Categories 8 and 9 have been combined to show the extent of student- talk- initiation during the lessons. Categories 10a and 10b which happen to be periods when the students are writing notes, doing experiments, drawing graphs and in short periods of silence or confusion have been grouped together since there is no much interaction between the teacher and the students.

From the bar graph, teachers in boys' and mixed schools used categories 1, 2, 3 and 4 relatively more than the teachers teaching in girls' schools. This implies that teachers in girls' schools did not praise their students like their counterparts in boys' and mixed schools. They also did not consider students' personal feelings and neither did they use students' ideas or modify them like their counterparts in boys' and mixed schools.

Teachers in girls' and mixed schools spent relatively more time lecturing as compared to teachers in boys' schools. Generally, in all school categories, there is high use of the lecture method. It should also be noted that there is a relatively low use of category 5c (lecture with demonstrations). In girls' schools, teachers used more commands and criticisms than in the boys' and mixed schools. This discouraged girls from participating in the lesson. The students' initiative was relatively low in girls' schools (6.27 %) as compared to mixed schools (9.36%) and the boys' schools (9.71 %).

Category 10a and 10b are also highly used as compared to the other categories with the teachers teaching in girls' schools having the highest percentage in the two categories combined. Categories 10a and 10b recorded highest values when the teachers used the lecture method relatively more.

Calculation and interpretation of I/D ratios. Teacher's teaching behaviour can be determined after knowing the kind of classroom climate, which prevails in the classroom. According to Njuguna (2000) there are three types of classroom teachers categorized according to the classroom climate they create. First, there is an autocratic teacher; this teacher does not consider the students' feelings. He/ she dominates the classroom talk. The work of the students in the classroom is to listen and obey orders. Secondly, there is a democratic teacher. This one allows the students to share and contribute in the classroom freely. Lastly, there is the Laissez- faire teacher who allows the students to do as they wish. This teacher is not in control of the class at all.

Calculation of the i/d ratio of the different teachers teaching in the three categories of schools is one way of knowing the kind of classroom climate the teacher creates while teaching. The i/d ratio is calculated by adding the sum total of indirect behaviour (represented by categories 1,2,3 and 4) divided by the sum total of direct behaviour (represented by categories 6 and 7). The type of classroom behaviour set by the teacher affects students' participation either positively or negatively. A democratic climate enhances learning because it encourages the students to be actively involved in the lesson. An autocratic teacher creates an environment full of tension where the learners are not free to participate. This hinders the learning process. Inamullah et al (2008) argue that the ratio between indirect influence and direct influence is given by: the sum of categories 1, 2, 3, 4, divided by the sum of categories 5, 6, 7. The ratio between positive reinforcement and negative reinforcement is given by dividing the sum of categories 1, 2, 3 by the sum of categories 6 and 7. On the other hand, student participation ratio is given by dividing the sum of categories 8 and 9 by total sum.

Table 2: I/D Ratios of Physics Teachers in Boys', Girls' and Mixed Schools

Type of School	**FIAC categories**		
	Categories 1,2,3 &4 (I)	**Categories 6 & 7 (D)**	**I/D ratios**
Boys'	92	163	0.56
Girls'	24	230	0.10
Mixed	79	235	0.34

Key:
I – Indirect teaching methods
D – Direct teaching methods

The table above shows that I/D ratios in all categories of schools are below 1. Comparing the I/D ratios in the three categories, it can be seen that teachers in boys' school are creating a relatively more democratic classroom climate. The students are free to participate during lesson time. The I/D ratio in this category (boys' schools) can be increased if the students are engaged in group discussions, debates and role plays in the classroom as the teacher teaches. Mixed schools are a little bit more democratic than girls' schools. Teachers teaching physics in girls' schools did not allow a lot of freedom for the girls to be able to participate freely. The teachers were somehow autocratic as compared to boys and mixed schools. It can be said that they created an autocratic climate in the classroom.

Calculation and interpretation of chi- square results for different categories of schools. One of the aims of this study was to find out whether there exists any significant difference in verbal interaction patterns among mixed, girls' and boys' schools. The chi-square was the most convenient tool to use to determine this. The chi- square results helped to determine whether the observed difference in teaching patterns among teachers in girls', boys' and mixed schools were statistically significant or not. The researcher used 0.05 level of significance obtained from the chi- square tables to determine this. If the results were giving values that were above this level, then the difference would be statistically significant.

For the purposes of analysis, the different types of direct and indirect teaching behaviour patterns were extracted from the collected data and the formula below was used to calculate the chi square values.

$$\chi^2 = \sum \left(\frac{(f_o - f_e)^2}{f_e} \right)$$

Where f_o is the observed frequency and f_e is the expected frequency.

In the calculation of chi- square, the test was administered to the direct and the indirect influence of the teacher while teaching and also to the students' talk initiation. Table 3 shows the values of the observed frequencies (f_o) and their calculated expected frequencies (f_e). The expected frequencies were calculated by multiplying the number of frequencies contained in the entire row, R_T by the number of frequencies contained in the entire column, C_T. The product of these two was then divided by the total number of observed frequencies (G_T).

$$f_e = \frac{R_T \times C_T}{G_T}$$

Table 3: Observed and Expected Frequencies for Categories 1, 2, 3 and 4 in Boys', Girls', and Mixed Schools

Observed and expected frequencies for categories 1, 2, 3 and 4 in boys', girls', and mixed schools; or, Modified FIAC categories	**Type of school**						
	Boys' **Girls'**	**Mixed**			**Totals of f_o**		
	f_o	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	
1 (accepts feelings)	3	4.0	2	2	3	2	8
2 (praises/encourages)	33	55	19	23	56	30	108
3 (accepts or uses student's ideas)	56	40	3	17	20	22	79
4 (asks questions)	444	437	200	182	210	235	854
Total	536	536	224	224	289	289	**1049**

Table 4: Nature of the Indirect Teaching Behavior Patterns of Teachers in Boys', Girls', and Mixed schools

Type of school	Modified FIAC categories								
	1(accepts Feelings)		2 (praises/encourages)		3 (accepts or uses student's ideas)		4 (asks questions)		Total χ^2 of 1, 2, 3 & 4 (**i**)
	f_o	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	
Boys'	3	4	33	55	56	40	444	436	
Girls'	2	2	19	23	3	17	200	182	
Mixed	3	2	56	30	20	22	210	235	
$\sum \frac{(f_o-f_e)^2}{f_e}$	**0.75**		**31.99**		**18.11**		**4.59**		**55.44**

At 6 degrees of freedom (df) the χ^2 results for i is 55.35. The critical value of χ^2 at the 0.05 level of significance is 12.59. This means that the χ^2 value at 6 df is statistically significant because it is more than the critical value. This means that there exists a significant difference in the indirect teaching behavior patterns of physics teachers in boys', girls' and mixed schools. This difference can be clearly seen in the I/D ratio for categories 1, 2, 3 and 4 of the girls' schools, which is 0.1 while the I/D ratio for the boys' and mixed schools are above 0.3. Teachers in boys' and mixed schools made a relatively higher use of the indirect methods of teaching compared to their counterparts in girls' schools.

Table 5: Calculation of the Expected Frequencies for Categories 6, 7, 5a, 5b, and 5c

Typeofschool	Modified FIAC Categories										
	6 (gives directions)		**7** (Criticizes)		**5a** (lecture with neither aids nor demonstrations)		**5b** (lecture with teaching aids)		**5c (**lecture with demonstrations)		Total f_o
	f_o	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	
Boys'	122	151	41	41	1520	1538	856	740	124	192	2663
Girls'	203	146	27	40	1206	1477	785	710	336	185	2557
Mixed	54	82	35	22	1126	837	212	503	22	105	1449
Total	379	379	103	103	3852	3852	1853	1853	482	482	**6669**

To determine whether there exists any significant difference in the direct teaching behaviour pattern of the teachers in the three categories, χ^2 values were again calculated for category 6,7,5a, 5b and 5c in the table 6 below.

Table 6: Calculation of χ^2 Values for Categories 6, 7, 5a, 5b, & 5c

Type of school	**Modified FIAC Categories**										
	6 (gives directions)		7(criticizes)		5a (lecture with neither aids nor demonstrations)		5b (lecture with teaching aids)		5c (lecture with demonstrations)		Total χ^2 for 6,7,5a, 5b & 5c
	f_o	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	**f_o**	**f_e**	
Boys'	122	151	41	41	1520	1538	856	740	124	192	
Girls'	203	146	27	40	1206	1477	785	710	336	185	
Mixed	54	82	35	22	1126	837	212	403	22	105	
$\sum\frac{(f_o f_e)^2}{f_e}$	**37.38**		**11.9**		**149.7**		**116.6**		**212.9**		**52.5**

The chi- square results obtained from table 6 can be used to test if direct teaching patterns of the teachers in boys', girls' and mixed schools differ significantly. From the table, the chi-square results at 8 df is 528.5. The critical value of chi- square at the 0.05 level of significance is 15.5. This shows that there exists significant difference in the direct teaching patterns of teachers in boys', girls' and mixed schools. Teachers in boys' and mixed schools made a relatively lower use of the direct methods of teaching compared to their counterparts in girls' schools. Again, this can be confirmed from the results in table 2, which gives the I/D ratios for the three school categories.

It was considered important to determine the nature of Students Talk (ST) in boys', girls' and mixed schools. Categories 8 and 9 have been used to determine this.

Table 7: Chi- square Values for the Nature of Students' Talk in Boys', Girls' and Mixed Schools

Type of School	**Modified FIAC Categories**				
	8 (student talk response)		**9**(student talk initiation)		Total of χ^2 categories 8 & 9
	f_o	**f_e**	**f_o**	**f_e**	
Boys'	439	431	31	39	
Girls'	246	250	27	23	
Mixed	212	216	23	19	
$\sum\frac{(f_o-f_e)^2}{f_e}$	**0.28**		**3.1**		**3.38**

At 2 df, the χ^2 results for categories 8 and 9 (students' talk) is 3.38. The critical value at the 0.05 level of significance is 5.59. This means that there was no significant difference in the patterns displayed by the students in their talk during the Physics lessons.

The students are not given ample time to ask questions or to participate in the lesson. This further implies that the teachers mostly used the lecture method. Inquiry methods of teaching were rarely being used. This is further proved by the fact that categories 1, 2, 3 and 4 are having very low percentages. This observation was cutting across all categories of schools. In general, the chi- square results have shown that teachers display significantly different teaching behaviour patterns with their students while teaching. Inamullah et al (2008) indicate that majority of teachers of English at college level generally use direct methods of teaching and this leads to low student's participation level during the teaching and learning process.

Conclusions

The researcher sought to determine whether there exists any significant difference in verbal interaction patterns in mixed, girls' and boys' schools. To achieve the objectives of the study, tools to gather information on classroom discourse were designed. In designing the tools, the following aspects were considered:

1. The kind of classroom atmosphere created by the teacher's verbal interaction patterns.
2. The type of teaching methods that elicit most responses from the learner.
3. The differences in verbal interaction patterns as displayed by teachers and their students while in the classroom.

The data collected from the chosen sample was used to achieve the objectives and answer the research questions stated to guide the study.

It was revealed that there was much use of direct methods of teaching across the different school categories. This was more dominant in girls' schools than in boys' and mixed schools. Teacher's talk dominated most of the lessons. The direct methods create an autocratic climate in the classroom. It also emerged that teachers in all categories of schools rarely used the in-direct methods of teaching rarely while teaching Physics. Teachers in girls' schools used direct methods the most. Students were rarely praised during Physics lessons. It should be noted that praising of students motivates them and helps them develop a positive attitude towards the subject. According to Rao & Undai (2006) teacher's influence motivates the learner to take initiative, contribute ideas, recognize, express and share feelings, develop meaningful relations, gain independence, interpersonal trust and harmony with the main social systems like family, school, peer group, teachers among others.

In addition, from the results obtained, there exists a significant difference in the verbal interaction patterns in boys', girls and mixed schools. Teachers display different interaction patterns while teaching depending on the gender of the students they are teaching and the sex of the teacher. For example, male teachers appeared to be more comfortable while teaching boys. The female teacher observed was not very comfortable while teaching boys. It is also worth-noting that female physics teachers are very few compared to their male counterparts.

The study has also revealed that categories 1, 2, 3 and 4 elicited the most responses from the students as compared to the use of categories 6 and 7, which discouraged the students. This means that teachers who used categories 1, 2, 3 and 4 mostly while teaching motivated their learners during the lesson.

Recommendations

The following recommendations have been made based on the findings of the study for future implementation:

1. There is need to avoid much use of the lecture method while teaching physics. Trainers of teachers need to emphasize this during their training sessions. The trainers should emphasize on the importance of using in-direct methods of teaching.
2. Teachers need to try as much as possible to boost creativity in their learners by using the discovery methods of teaching. In doing so, they will give the learners room to discover Physics laws, theories and principles on their own. This practice should be extended to in-service training programmes.
3. There is need for the policy makers to look for ways and means of campaigning for attitude change towards Physics in students. This will probably lead to an increased number of girls taking Physics up to Form Four. This will possibly lead to an increased number of ladies who will be willing to train as Physics teachers.

4. There is need for teachers to avoid criticizing their learners' answers or giving them a lot of directions (steps to follow) while teaching because this hinders learner participation in the lesson and hinders creativity.
5. Universities and colleges should look for ways to encourage female students to train as Physics teachers. One way can be by reducing the cluster points for ladies joining the teaching profession as Physics teachers.
6. Teachers should try as much as possible to use the indirect methods of teaching so as to maximize the freedom of the learners to participate during the teaching- learning process.

References

Draper, S. (2002). Electronically enhanced classroom interaction. http://www.psy.ac.uk. 3rd December 2007.
Flanders, A.N. (1970).*Analyzing Teaching Behaviour.* Massachusetts, Addison-Wesley Publishing Company.
Inamullah M. H, Hussain, I & Naseer M. U (2008) *College Teaching Methods & Styles Journal – April 2008 Volume 4, Number 4* 29
Muthwii, S. (1981). A study of verbal classroom interaction patterns of a selected sample of teachers in Machakos district. Nairobi: University of Nairobi, M. Ed Project, unpublished.
Njuguna, J.N. (2000). Verbal interaction patterns of selected secondary school home-science teachers with their students in Nairobi province. Nairobi: Kenyatta University, M. Ed theses, unpublished.
Rao T.V & Undai P. (2006). *Changing teacher behaviour through feedback.* Hyderabad: The ICFAI University Press.
Pollard, A. (2005). *Reflective teaching*. London: Continuum.
Sotto, E. (1995). *When teaching becomes learning.* New York: Casell Publishers.

Appendix I

A Modified Flanders' Interaction Analysis Categories Used During the Study

TEACHER TALK	INDIRECT INFLUENCE	1. ACCEPTS FEELING. Accepts and clarifies the feeling tone of the students in a non-threatening manner. Feelings may be positive or negative. Predicting or recalling feelings are included 2. PRAISES OR ENCOURAGES. Praises or encourages student action or behaviour. Jokes that release tension, not at the expense of another individual; nodding head or saying "um hm?" or "go on" are included 3. ACCEPTS OR USES IDEAS OF STUDENTS. Clarifying, building, or developing ideas suggested by a student. As a teacher brings more of his own ideas into play, shift to category five. 4. ASKS QUESTIONS. Asking a question about content or procedure, based on teacher ideas, with the intent that a pupil will answer.
	DIRECT INFLUENCE	5. LECTURES: This category is divided into: (a) Lecture by involving only talk by the teacher without any aids to enhance the ideas. (b) Lecture with illustrations or

		aids. The lecture here uses charts, diagrams, real objects and chalkboard illustrations. (c) Lecture with demonstrations where the teacher performs an experiment or a practical to enhance the lesson. 6. GIVES DIRECTIONS. Directions, commands, or orders to which a student is expected to comply. 7. CRITICIZES OR JUSTIFIES AUTHORITY. statements intended to change student behaviour from non-acceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.
		8. STUDENT TALK-RESPONSE: a student makes a predictable response to teacher. Teacher initiates the contact or solicits student statement or structures the situation. Freedom to express own ideas is limited. 9. STUDENT TALK-INITIATION: Talk by students that they initiate. Expressing own ideas; initiating a new topic; freedom to develop opinions and a line of thought, like asking thoughtful questions; going beyond the existing structure.
		10. SILENCE OR CONFUSION: This category is divided into: (a) Students performing experiments, making observations, recording measurements and drawing graphs. (b) Short periods of silence and confusion when communication cannot be understood by the observer.

NOTE: There is no scale implied by these numbers. Each number is classificatory; it designates a particular kind of communication event. To write these numbers down during observation is to enumerate, not to judge a position on a scale.

EFFECTS OF CONCEPT MAPPING BASED INSTRUCTION ON STUDENTS' ACHIEVEMENT IN PHYSICS IN SECONDARY SCHOOLS, KENYA

Vincent O. Wasonga
Kenyatta University
wovincent@yahoo.com

Nicholas W. Twoli
Kenyatta University
nicholastwoli@yahoo.com

Gichuhi Waweru
Kenyatta University
giwawa06@yahoo.com

Candidates' responses to a large extent show partial concept development (KNEC, 2006). The purpose of this quasi-experimental study using pre-test and post-test with control and experimental groups was to determine if combining instructional concept mapping (ICM) and conventional instructional techniques (CIT) would improve students' achievement in physics. Validated instruments were used to gather data on students learning achievements in physics, role of physics teacher and student, and challenges encountered in ICM and CIT lessons. Analysis of data was done using both descriptive and inferential statistics. It was found that students in the concept mapping group were more participative in class and obtained a statistically significant higher mean gain on the physics test compared to the non-concept mapping class, with $p < 0.05$. It was concluded that generating instructional concept maps is an effective teaching and learning tool for developing physics concepts.

Keywords: Instructional concept mapping, Conventional, Improve, Achievement

Introduction

Kenya's economy requires a steady supply of scientifically and technologically knowledgeable human resource (Mutahi, 2009). This underscores the fact that science and technology have immense contribution to the growth and development of a country. Consequently, students should be equipped with the necessary knowledge and skills in science and technology to function in modern times.

Any breakthrough in science and technology is deeply rooted in the strength of science education. It is in recognition of this dominant position occupied by science that during the Fifth Ordinary Session of the Conference of Ministers of Education in Africa (COMEDAF V) held in April 2012 in Abuja, Nigeria, Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) was showcased as model 'Centre of Excellence' in the promotion of quality of mathematics and science education at the basic level in Africa (Mutula, 2012).

Physics is one of the science subjects taught under science education. Advancements in technologies in information and communication, medical, environmental, crime control and security, among others, are some of the achievements brought about by physics. Therefore, specific priority of physics in the development of scientific and technological programmes of a nation is important.

In Kenya, the experience of low enrolment and poor performance in physics among students at varying levels of learning is reflected in the candidates' performance in the Kenya Certificate of Secondary Education (KCSE) Physics examination between the years 2006 and 2010 as shown in Table 1.

Table 1: Candidates' Overall Performance in Physics in the Years 2006 to 2010

Year	Candidature	Percentage Candidature	Maximum Score	Mean Score	Standard Deviation
2006	72,299	29.70%	200	80.63	73.00
2007	83,162	30.12%	200	82.63	35.00
2008	93,692	30.72%	200	73.42	35.43
2009	104,883	31.09%	200	62.62	34.02
2010	109,811	30.72%	200	70.22	35.73

Source: KNEC KCSE Examination Reports (2006 - 2010)

From Table 1, it can be observed that students' participation in physics reduces as they progress through education with enrolment in KCSE ranging between 29.70% and 31.09% of the total candidature. The mean students' performance in the examinations has also stagnated at scores between 62.62 and 82.63 out of a maximum score of 200.

The poor performance in the physics national examinations calls for intervention. This formed the basis of cooperation between the Government of Kenya (GOK) through Ministry of Education, Science and Technology (MOEST) and the Government of Japan (GOJ) through Japan International Cooperation Agency (JICA) since 1998 to build capacities of mathematics and science teachers through the Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project. It was an intervention to address poor students' performance in mathematics and science subjects in the KCSE examination. The overall goal was to upgrade ability of secondary school students in mathematics and science through In-Service Education and Training (INSET) of teachers of these subjects to improve their teaching.

At the onset of SMASSE Project in 1998, a baseline study was conducted to identify factors responsible for poor performance in mathematics and science at secondary school level. The study identified negative attitude toward mathematics and science, poor teaching methodology, inadequate mastery of teaching subject content, inadequate teaching and learning materials that include ill-equipped laboratories, and school management among other factors (Waititu and Orado, 2009). The project technical team identified teaching methodology as the overriding factor and focused on INSET for teachers to improve their teaching practices. The project team designed an instructional approach known as ASEI-PDSI approach, an acronym for Activity, Student, Experiment, and Improvisation (ASEI) and Plan, Do, See and Improve (PDSI). This approach endeavours to shift teaching and learning from knowledge-based teaching to activity-based learning, teacher-centred teaching to learner-centred learning, expository to experiment, research and improvisation.

Concept mapping based instruction is one of the instructional strategies advocated by CEMASTEA as a learner-centred learning approach (Makoba, 2012). Concept mapping is a meta-learning strategy based on the Ausubel-Novak-Gowin theory of meaningful learning (Novak and Gowin, 1984). Its advantage lies on the fact that learning new knowledge is dependent on what is already known. It upholds that new knowledge gains meaning when it can be largely related to a framework of existing knowledge rather than being processed and stored in isolation. It mainly emphasizes the meaningful relationships between variables or sub-concepts in the main concept.

Concept mapping based instruction is considered an active rather than passive learning task, and it serves as an elaborative study activity when students are guided to construct concept maps in the presence of the materials they are learning. It requires students to enrich the material they are studying and encode meaningful relationships among concepts within an organized knowledge structure. Instructional concept maps also serve to reinforce students' understanding, and assess their achievement, among other educational applications.

In view of the immense contribution of concept mapping based instruction to the process of teaching and learning science and mathematics, it is an invaluable area for more research, particularly in the case of SMASSE's ASEI-PDSI implementation programme.

Purpose of the Study

The purpose of this quasi-experimental study was to determine if combining instructional concept mapping and conventional instructional techniques would improve students' achievement in physics, focusing on the topic 'electric current'. The research questions investigated in this study were as follows:

1. Does concept-mapping strategy improve students' achievement in Electric Current?
2. What are the roles of teachers and students in lessons employing concept mapping strategy and conventional instructional techniques?
3. What are the challenges encountered by physics teachers and students when using concept mapping strategy as compared to those using conventional instructional techniques?

This study focused on concept mapping as a learner centred approach and students' achievement in Physics in public secondary schools in Nairobi County. Achievement was evaluated on the basis of students' performance in achievement tests.

Various aspects of the teacher and the learner during physics instruction were considered. Among the teacher aspects included variation and integration of instructional strategies during physics lessons. These strategies range from teacher centred and interaction approaches to learner centred approach with main emphasis on concept maps.

On the other hand, learners' characteristics during the physics lessons were evaluated on their ability to integrate new knowledge to existing structures in order to retain knowledge and receive meaning of the concepts learned, and to identify gaps in knowledge. This involves diagnosis of misconceptions.

The findings of this study are limited to the sampled schools and may vary from the rest due to their unique characteristics and other factors that influence performance other than instructional techniques, such as attitude and motivation. The findings are also limited to the topic 'electric current' and the extent to which the guideline for using the concept mapping approach was adhered to.

Research Design

This study used quasi-experimental design using pre-test and post-test with a control group and experimental group. This research design was as shown in Figure 1. The following were considered the main variables of the study. The independent variable was "use of Instructional Concept Maps (ICM) and Conventional Instructional Techniques (CIT)" while the dependent variable was "Students' achievement in physics". The CIT included lecture, discussions, demonstrations, and laboratory experiments.

Experimental:	R	O_1	X	O_2
Control:	R	O_3	X	O_4

KEY:

O_1 and O_3 – Pre-test

X Treatment

X No Treatment

O_2 and O_4 – Post-test

R – Randomly selected

Figure 1: Research Design for the Study

Purposive sampling was used to select public secondary schools that offer physics curriculum at form three since they were the target population for this study. Stratified random sampling was then used to select the boys' and girls' secondary schools. In the sampled schools, Form Three physics students were purposively selected to consider the topic, *electric current*, which was being taught at this level. Random sampling was then used to select streams and assign them into experimental and control groups.

The participants in this study were four streams (whole classes) of form three physics classes. The boys' and girls' schools were represented by two streams each. Each stream had 33 students. One stream in sampled boys' school was assigned experimental group. The other one was assigned control group. A similar approach was used for sampled girls' school. The three physics teachers for the sampled streams were included in the study as research assistants.

Four validated data gathering instruments were used: (a) a classroom observation schedule, (b) a teacher questionnaire, (c) a student questionnaire, and (d) two physics' achievement tests; pre-test and post-test. These were free response style written tests consisting of 20 items to be answered in one hour and were used to measure the learners' performance in physics. The objective was to measure the students' knowledge on concepts of physics before and after the treatment. The pre-test was set from topics before electric current while post-test was set from the electric current topic. Both pre-test and post-test were set and moderated by a panel of three physics teachers. A table of specification was used to construct the test items and to ensure they were well balanced in terms of knowledge and skills tested (Maundu, Sambili and Muthwii, 2005). Content validity was achieved through subject matter expert's verifications based on the experts' opinion of experienced physics teachers.

The classroom observation schedule was used to gather data on the observed roles of teachers and students in lessons using ICM and those of CIT. The instrument was administered during the lessons. Student questionnaire was adapted and modified from Simonson (1984:302). It was used to gather data on the challenges faced by teachers and learners during instructional process. It consisted of a number of items on a Likert scale that required the participants to give a rating to a given statement on a scale of 1 (strongly disagree) to 5 (strongly agree). The reliability estimate of the questionnaire was determined during the pilot study and necessary modifications made on the items.

Data Collection Techniques

Pre-test on physics was given to both groups prior to the intervention. The pre-test result enabled the researcher to determine the equivalence of the groups' ability in physics concepts at the beginning of the study (Table 4.1), which is essential in the quasi-experimental method.

During the intervention, the experimental group was taught 'electric current' concepts using concept maps as a teaching and learning tool while the control group was taught the same concepts without using concept maps. Concept maps were drawn progressively by the teacher and students in line with the progress of the lesson. At the end of the lesson, an overview of the main concepts and their sub-concepts including their propositional links were produced. Students further worked in supervised groups to produce more concept maps for the same concepts learned during a lesson.

The classroom observation schedule was used to collect observed data on lessons employing instructional concept mapping and on those of conventional instructional techniques. The two groups in girls' school were taught by two assisting teachers through a coordinated team teaching while the two groups in boys' school were taught by one teacher. Participating teachers followed teacher's instructional guide to ensure that they adhered to the principles guiding the experiment especially the teaching methods while they taught the 'electric current' topic and its related concepts. It was to eliminate the possibility of the teachers introducing their biases. Both groups were given the post-test after completion of the topic. The questionnaires were then administered to the participating students and teachers.

Results and Discussion

The students' pre-test scores were used to calculate the mean, standard deviation and the standard error of mean of both the experimental and the control. The mean scores on the pre-test were very close for the two groups indicating the two groups were of equivalent ability in physics (Table 2).

Table 2: Pre-test Scores for Experimental and Control Groups

			Descriptive statistics			Levene's Test for Equality of Variances	
School	**Group**	**N**	**Mean (Max $\bar{x}$ =40)**	**Std. Deviation**	**Std. Error Mean**	***F***	***p***
A (Boys)	Experiment	33	17.18	4.8118	0.8252	0.0129	0.9100
	Control	33	16.76	5.1783	0.9014		
B (Girls)	Experiment	33	18.79	6.0247	1.0650	0.0609	0.8059
	Control	33	18.36	5.8085	0.9961		

Comparison between the mean scores was carried out using an independent-samples t-test. The *t*-test results showed that the difference was not statistically significant (Table 3). Therefore, the two groups in both schools were assumed to be equivalent with respect to their initial knowledge and understanding of physics concepts.

Table 3: Independent *t*-test Results on Initial Group Differences

		Independent t-test for Equality of Means						
School							**95% Confidence Interval of the Difference**	
		t	**df**	**Sig. (2-tailed)**	**Mean Diff.**	**Std. Error Diff.**	**Lower**	**Upper**
A (Boys)	Equal Variances	0.3447	64.000	0.7314**	0.4242	1.2305	-2.0341	2.8825
	Unequal Variances	0.3447	63.658	0.7314	0.4242	1.2305	-2.0348	2.8832
B (Girls)	Equal Variances	0.2913	64.000	0.7718**	0.4243	1.4568	-2.4860	3.3346
	Unequal Variances	0.2913	63.915	0.7718	0.4243	1.4568	-2.4869	3.3355

**Difference is not statistically significant, *p*>.05

The students' achievements of electric current concepts were investigated for both the experimental and control groups. Table 4 shows the descriptive statistics and Levene's test for equality of variances results on difference in students' achievements. The data were obtained immediately after the intervention and therefore this is considered as the immediate learning gain.

Table 4: Descriptive Statistics Results for Difference in Learning Gains

			Descriptive statistics			Levene's Test for Equality of Variances	
School	**Group**	**N**	**Mean (Max $\bar{x}$ =40)**	**Std. Deviation**	**Std. Error Mean**	***F***	***p***
A (Boys)	Experiment	33	21.18	5.3060	0.9100	0.4048	0.5269
	Control	33	18.48	4.7112	0.8201		
B (Girls)	Experiment	33	25.03	5.4514	0.9637	1.1255	0.2927
	Control	33	21.91	6.2016	1.0636		

An independent-samples t-test was conducted to compare students' achievement of the learned electric current concepts in ICM and CIT lessons. In boys' school, there was a statistically significant difference in the scores for experimental (M = 21.18, SD = 5.3060) and control (M = 18.48, SD = 4.7112) groups at the 5% level of significance; t (64) = 2.1834, p = 0.0327. Similarly, in Girls' school, the immediate mean gain score for the experimental group (M = 25.03, SD = 5.4514) was high compared to the control group (M = 21.91, SD = 6.2016) and the difference is statistically significant at the 5% level, t (64) = 2.1715, p = 0.0336 based on an equal variance independent *t*-test (Table 5).

Table 5: Independent *t*-test Results for Difference in Learning Gains

		Independent t-test for Equality of Means						
School		**t**	**df**	**Sig. (2-tailed)**	**Mean Diff.**	**Std. Error Diff.**	**95% Confidence Interval of the Difference**	
							Lower	**Upper**
A	Equal Variances	2.1834	64.000	0.0327*	2.6970	1.2352	0.2294	5.1646
(**Boys**)	Unequal Variances	2.1834	63.116	0.0327	2.6970	1.2352	0.2286	5.1654
B	Equal Variances	2.1715	64.000	0.0336*	3.1212	1.4374	0.2498	5.9926
(**Girls**)	Unequal Variances	2.1715	62.965	0.0337	3.1212	1.4374	0.2480	5.9944

*Difference is statistically significant, $p < .05$

The equal variance independent *t*-test was used after ascertaining that the two groups have similar variances as indicated by the *p*-value for the Levine's test that is greater than 0.05 (Table 4). The statistically significant difference in the *t*-test result means that the experimental group was superior to the control group suggesting the benefit of instructional concept maps on learning. Novak and Musonda (1991) showed that students taught using concept maps posses more valid science concepts and hold fewer misconceptions compared to students instructed using conventional methods.

Roles and Challenges of Teachers and Students in ICM and CIT Lessons

The primary role of a classroom teacher as an instructor is to plan and implement study lessons in a manner that helps students to develop and relate concepts. A teacher is supposed to teach areas of the curriculum, monitor, evaluate and report students' progress in key learning areas, and implementing strategies to achieve targets related to specific student learning outcomes. The research findings established the following; (a) teaching strategies commonly employed by teachers are teacher centered or interactive, and rarely learner-centered. Other than national examinations oriented experiments (practical), teachers rarely plan activity-based lessons; (b) teachers did not find difficulty in using instructional concept maps for the first time; (c) teachers rank high on their ability to prepare the learners before using a specific teaching strategy and that they demonstrated competence on the use of specific strategies/methods.

Further findings showed that; (a) teachers were able to review the lessons much better in ICM lessons than in CIT lessons, giving summary to the lesson during or at the end of the lesson. We can suggest that constructed concept maps gave a summary of the concepts learned during the lesson and made it easy for the teachers to review the lessons; (b) teachers were able to report/reinforce key points in the presentation immediately in ICM lessons unlike in CIT lessons where teachers mostly reported/reinforced key points at appropriate breaks. This is possibly because the level of teacher-student and student-student interaction in ICM lessons is relatively high and that immediate response is necessary in the process of constructing the concept maps; (c) the level of learners' participation and interaction with the teaching resource was high in ICM lessons compared to CIT lessons. This could be attributed to the fact that learners in ICM lessons worked in groups, and were directly involved in construction of the concept maps and teachers only served to facilitate the process. This shows that ICM lessons have the students at its centre in an active role and teacher in a passive, instructive role. We can also say that perhaps students' participation in the lessons, and interaction with learning resources and with each other in CIT lessons is only limited to question-answer sessions, discussion, teacher guided problem solving sessions and during experiments which are in themselves not adequate; (d) students in ICM lessons asked questions and sought guidance "a great deal". This was unlike in CIT lessons in which students "fairly adequately" asked questions or sought guidance.

Conclusions

Based on the study findings, the following conclusions were made. First, given that in the post-test, the mean difference between the two groups was large enough and the equal variance independent-samples t-test confirmed that the difference is statistically significant at 5% level of significance and 95% confidence level (interval), the study concluded that concept mapping instruction has a positive effect on students' achievement in physics.

Secondly, the study concluded that teachers commonly used teacher centered or interactive teaching methods mainly because they are either "not ready" or are unprepared to plan and implement activity-based or learner-centered lessons as advocated by SMASSE's ASEI-PDSI programme. Such activity-based lessons are slightly more involving in terms of time and effort to plan compared to teacher-centered or interactive based lessons. Teachers tend to prefer strategies based on ease of use of the strategies/methods.

Thirdly, instructional concept maps were viewed as a better way of summarizing concepts learned during the lesson thereby making it easy for the lessons to be reviewed and key points reported or reinforced as is required. Fourth, learners' participation is high in student centered learning. The level of students; interaction with the teaching resource and with each other is also high. This translates to active learning and students taking responsibility for their own learning.

Lastly, that the challenges teachers and students encounter during the lessons influence the quality of instruction. These challenges are the same for all teaching strategies/methods. However, most of these challenges are easy to overcome by adopting certain teaching strategies.

Acknowledgement

My sincere gratitude goes to the principals of the two participating schools, the science head of department and physics teachers of the schools for their assistance during the data collection process. Physics teachers were particularly supportive. They actively got involved in the study as research assistants and had even to change their teaching approaches to facilitate the study. My appreciation also goes to the students who participated in the study.

References

Kenya National Examinations Council. (2006). *2005 KCSE Examination Report*. Nairobi: The Kenya National Examinations Council.

Kombo, D., & Tromp, A. (2006). Proposal and Thesis Writing: An Introduction. Nairobi: Paulines Publications Africa.

Lawshe, C. H. (1975). A Quantitative Approach to Content Validity. *Personnel Psychology*, 28(4).

Lehman, J., Carter, C., & Kahle, J. (1985). Concept mapping, vee mapping and achievement: results of a field study with black high school students. *Journal of Research in Science Teaching, 22*(7). Makoba, K. (Ed.). CEMASTEA - Instructional Strategies. Retrieved August 4, 2012 from http://cemastea.wikispaces.com/Instructional+Strategies

Makoba, K. (Ed.). *CEMASTEA – Instructional Strategies*. Retrieved August 4, 2012 from http://cemastea.wikispaces.com/Instructional+Strategies

Maundu, J. N., Sambili, H. J., & Muthwii S. N. (2005). Biology Education. A Methodological Approach. Nairobi: Lectern publications Ltd.

Mugenda, O. M., & Mugenda A. G. (1999) Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Mutahi, K. (2009). *CEMASTEA Strategic Plan (2009-2013): Statement by the PS, MOE*. Retrieved August 4, 2012 from http://www.education.go.ke/Documents.aspx?docID=441

Mutula, K. (2012, July 9). Upgrading and refurbishing of CEMASTEA for quality delivery of mathematics and science education in Africa: Message from the minister, MOE. Daily Nation, 32.

Novak, J. D., & Gowin, D. B. (1984). *Learning How to Learn*, Cambridge: Cambridge University Press.

Novak, J. D. and Musonda, D. (1991). A twelve-year longitudinal study of science concept teaching. *American Educational Research Journal*, 28.

Waititu, M. and Orado, G. (2009). Managing Teachers and the Instruction of Mathematics and Science: Lessons from the SMASSE Experience in Capacity Development. Paper presented at Secondary Education in Africa (SEIA) Follow-up Technical Workshop on Science and Mathematics. Retrieved August 4, 2012 from http://info.worldbank.org/etools/docs/library/245737/day8 2b. PAPER Lessons from SMASSE OradoMaichael.pdf

TEACHING PRACTICE AS INTERNSHIP

Dr. Risper Wepukhulu
Kibabii University College
rwepukhulu@kibabiiuniversity.ac.ke

Irene Simiyu
Kibabii University College
Irene_wanjala@yahoo.com

Learning to teach is a multi-dimensional process that extends beyond the three main components of pre-service teacher preparation that include: imparting subject content knowledge, pedagogical knowledge and the practical aspect that introduces school-based experiences. While these three components are important aspects of preparation as offered by universities and teacher training colleges, the practical component herein referred to as the Practicum or Teaching-practice holds a very special place basically because it provides an opportunity for theory to be turned into practice. For the student-teacher, practicum is an opportunity to understand the dynamics of classroom teaching, while for the faculty, it is an opportunity to observe how their students use knowledge acquired in the lecture halls. On the other hand, research and literature in the field of teacher education agree that if practicum is not well designed, it can lead to limited experiences for the student-teacher that may not prepare them well for the profession while also leading to high attrition in the profession. This paper examines the aspect of teaching practice from literature and studies and then engages in an analysis of models of teaching practice used in schools of Education in Kenyan institutions of higher learning. The paper then proposes a re-conceptualization of practicum to internship that will be an extended period placed in the final year of the Bachelor of Education program; mentoring of student-teachers by practicing teachers and, the establishment of partnerships among schools and universities that will lead to an internship-like program.

Introduction

Education is increasingly being regarded as the means by which a Nation can adapt to social, economic and cultural change and thus the sustained focus on the facilitators of the educational experiences: the teachers. There is consensus among scholars and educational stakeholders that what teachers know, do and care about has a major influence on what students learn, thus the need to invest in the learning of teachers (Hatties, 2003 cited in Meiers 2007). Indeed, many studies and literature on teacher education have established that if an education system has to serve the needs of society, then the kind of training given to the teachers must be in tandem with the accelerating changes in the world and the variety of learners in today's classrooms and schools. Institutions that provide initial teacher preparation and the curriculum they adopt in the preparation have become the focus of policy makers and educational stakeholders, the world over. There is a growing understanding that a well-trained teaching force is an important factor in improving education quality by implementing the many reforms that characterize education systems worldwide (OECD, 2001). The expectations of teachers by governments and society are high! It is hoped that they must provide tomorrow's world with citizens who will spur their countries into achieving great heights in social, economic and political spheres. As they do so, teachers are expected to exhibit certain characteristics that go beyond intellectual and academic qualifications. According to Coolahan (2002), the key characteristics for today and tomorrow's teachers include among others: a deep understanding of her/himself and the nature of his work; should possess a wide range of professional skills in teaching, planning, assessment and personal relationships and, the ability to cooperate as a team player. It is a truism that such characteristics can best be natured and established in a school environment and thus the contention of this paper that teaching practice/practicum should allow this experience to be established before the prospective teacher enters the profession. This paper will briefly discuss the rationale for teaching practice in initial teacher preparation.

Rationale for Teaching Practice

Teaching practice is a long established component of teacher training and this is with good reasons key among them are, firstly, the need to provide an avenue where there is praxis between theory and practice in teacher education (Darling-Hammond, 2008). Course units offered in the schools of education in institutions of higher learning consist mainly of theories, models and principles that underlie pedagogy. These theories, models and principles need to be applied to real life situations that are present in the classroom and school environment. In a sense these ideas define the profession and one is not fully a teacher unless they have learnt and can apply the principles of pedagogy. All countries the world over are experiencing massive school enrolment coupled with limited resources to support and enhance education and a competent teacher is one of the key factors that will ensure realization of education goals. A well-prepared teacher who has an idea of the system they will work in is a resource for the government to invest in. Such a teacher is one who can apply theory in practice to facilitate learning for a variety of learners in the classroom and school of the 21st Century.

Secondly, teaching practice is expected to provide opportunities for the prospective teacher to see what good teachers do, to interact with these model teachers and get insights into how they understand and appreciate their work. Best practice by teachers in terms of content delivery, appropriate interaction with learners and the administration and even conduct in various positions of leadership, are aspects that can only be found in real school and classroom situations. If the prospective teacher has to avoid falling back to what they gained as students in what is termed 'apprenticeship of observation' that may include bad habits and narrow views of the profession, then they must observe good practice. It is a truism that all human beings fall back to what they have seen when they are faced with situations that demand action and if they have observed best practice that is admirable, they will apply it. Most of those who take the Bachelor of Education degree may have found themselves here for various reasons, but to assist them make up their mind to stay in the profession, they need to see best practice and good teachers.

Thirdly, teaching practice should provide opportunity for the student-teacher to understand the profession by engaging in inquiry into the lives of the learners, evaluating the learning outcomes and the school community that includes the administration, colleague teachers, non-teaching staff and parents (Darling-Hammond, 2000). A majority of student-teachers only have experience as students in a school and thus the need for them to take up the new role of a prospective teacher interacting with the members of the school community. This is an experience that cannot be found in a lecture hall or textbooks on education, yet it forms the daily experiences of a teacher who has understood other stakeholders in the school, as well as identified their position in the school system. It is a truism that when one inquires about their profession, they are likely to be concerned about it and also likely to remain in it despite the challenges that are present or emerging. Well structured teaching practice should allow for the student-teacher to gain the skill of inquiry since the school experience will bring with it many issues that need solutions and way forward. A teacher who inquires is a lifelong learner who will seek to understand the challenging situations, alone or in a team with other members of the school community. It is an established reality that teaching can be a lonely job and thus situations that lead to collaborative ventures are a welcome means of developing relationships of care and trust.

Fourthly, it is expected that teaching practice will provide an opportunity for the student-teacher to develop skills that are key to the profession like: fluent speaking, ability to share information, meaningful reading, working in teams and using resources to achieve teaching learning objectives (Gujjar, 2009). For the student teacher, it is not enough to have intellectual knowledge of pedagogical content knowledge and knowledge of pedagogy, given that teaching is a more complex task than intellectual knowledge. Teacher training presumes that knowing content knowledge does not presuppose that one will be able to pass it on to another person and more so, a young person, thus the need for one to develop appropriate skills for teaching. Teaching practice is a moment to test one's ability to facilitate learning and to do so professionally in ways that will make learning meaningful for the learner and improve the learning outcomes. It is also in the school experience that the prospective teacher can also identify desirable interests and develop attitudes and ideas relative to teaching (Ibid). This could include participation and involvement in co-curricular activities, leadership positions and facilitation of school improvement ventures like benchmarking and setting and marking joint examinations.

Fifthly, teaching practice is an opportunity to evaluate the student as a potential teacher. As a component of the Bachelor of Education degree, teaching practice provides an insight into the ability of the student-teacher to successfully teach and do all that appertains to the course, as well as point out the likelihood of them staying in the profession. For the faculty, teaching practice is a component that contributes towards certification of the prospective teacher and thus supervision and assessment are done while observing the teacher in class. Poor or mediocre performance in this component could mean that one needs more preparation to take up the role of teaching while positive feedback about one's ability in this area could imply that one is ready to teach. The experience that student-teacher goes through during their teaching practice could also determine their resolve to pursue the profession or seek for other careers and try their hand in them. Given the above reasons for the teaching practice component in teacher training, it will be important to understand how this component is structured in the schools of education in Kenya.

Models of Teaching Practice in Kenya

The Kenyan educational system provides two levels for the training of teachers, that is, universities who train teachers for secondary and tertiary institutions and the teacher colleges that train teachers at diploma level for secondary school and certificate for primary and early childhood centers. An examination of these institutions of teacher training reveals two broad models that have served the education system well, this far. The first is that practiced by pioneer schools of education like Kenyatta University, the University of Nairobi and others, where the practicum is positioned in either the third or fourth and therefore last year of the Bachelor of Education degree. The model allows for student teachers to be placed in institutions of their preference where they expect to be assessed (supervised!) at least three times during the entire period. The assessment is purely in terms of content delivery and classroom conduct for the teacher. The placement schools are usually encouraged to provide mentorship for the student –teachers by allocating a cooperating teacher to the student. The cooperating teacher may or may not take up their role especially after off-loading their lessons on the practicing teacher, a factor that leaves the faculty as the only ones to provide feedback on the student-teacher's performance. The fact that the session is viewed as assessment leads to anxiety in the student teacher, especially when the frequency of visitation is far apart leading to less rapport, more fear of failure and less assurance about performance.

The second model is that used by Diploma teacher colleges who expect their students to undertake the teaching practice after their final examination in the third year, where they stay in a school for two terms. The students are also placed in schools of their choice and assessed at least three times. The college tutors supervise the first term while it is hoped that the school will work with the teacher in the second term in what could be termed as unpaid internship. Apart from the extended length of the session, the student teachers from diploma colleges are also expected to participate in other areas of the school like in co-curricular activities and are assessed in their performance. In a situation similar to that of student teacher undertaking the degree, students in the diploma colleges also suffer fear and anxiety over supervision and make very deliberate efforts to impress on the day of assessment. During the second term of the teaching practice, the placement school is expected to assist the student teacher by providing mentoring, however, since this is not followed up, very few schools provide the necessary assistance.

From the above explanation of how teaching practice is structured in Kenyan schools of education (the same happens in other schools of education worldwide!), one may conclude that there is need for new dimensions to be introduced into the teaching practice component. Literature and studies on teacher preparation seem to concur on the view that teaching practice as described above is deficient in leading to the teacher for today and tomorrow's schools. Among the reasons provided include: firstly, the issue of the time allocated for teaching practice as being brief and sometimes poorly positioned and thus the need for an extended period that will result in supervision that provides formative rather than summative feedback (Coolahan, 2002). Secondly, the current model of teaching practice focuses on the classroom teaching experience yet school is not just about teaching and includes other broader features of the school. Thirdly, that placement schools find themselves having to bear with the student-teachers and for lack of training and identification of teacher mentors, the schools do not offer adequate support to the student-teacher leading to very little in terms of gains from practicing teachers. Fourthly, the current model of teaching practice does not foster inquiry yet schools and the education systems are facing accelerating changes that require understanding, solutions and sometimes adoption that is driven by inquiry. Lastly, this model leads to a prospective teacher who works alone yet there is an increasing need for teachers to work collaboratively in collegial groups that offer them support in this challenging profession. While agreeing with the above reasons and cognizant of the large numbers of those seeking a degree in education in Kenya, this paper proposes a re-conceptualization of teaching practice to capture new dimensions of the school experience in what is an internship-like arrangement.

Teaching Practice as Internship

According to Zugelder and Nichols (2014), interns are developing teachers who can be compared to adolescents in the sense that they require consistent coaching, strong, effective and meaningful communication and specific feedback. All this is if they have to be assisted to love their profession and remain in it even after getting the certificate. A number of studies exist that have examined the issue of teacher attrition and among the key findings is the view that the teachers felt inadequate to handle their job and did not have any intrinsic motivation to love their job. If this situation is to change, then teaching practice should be structured like internship for the following reasons: first, there is need for an extended school experience that consists of more than supervision to include positive coaching and mentoring experiences. It is time faculty and tutors moved away from just visiting the student-teachers with a view of assessing their classroom experience of content delivery, to having dialogue and interaction to tease out the links between theory and practice. Darling-Hammond (2008) contends that extended periods of up to one year can result in prospective teachers who are more satisfied with their preparation and who have positive feelings that Principals, colleagues and cooperating teachers view them as better prepared. While it is not the amount of time spent in the field that is of importance here, but it is the way the time is structured and the outcome of the interaction that matters most.

Second, the extended period will allow for intensive clinical supervision that is key to improving the uptake of knowledge and improvement of performance. According to Zugelder and Nichols (2014), the time used in the internship process will help the student-teacher to be committed to self improvement, correction and reflection. A teacher who strives to better their performance from the onset is likely to stay in the profession and to make positive contribution to their job and learners. While teaching practice that concentrates on the classroom experience and is structured to lean towards assessment can be compared to a hit and run affair, internship is deliberate and aimed at assisting the student-teacher to understand their job clearly in an environment that offers support and guidance.

Third, the extended period will allow for the development of skills and competencies through group dynamics and hands-on experiences that develop over time (Hussan et al, 2010). In a study that was carried out in Islamabad University to evaluate the role of school-based internship, the above author established that an extended period resulted in the professional development of student-teachers a factor that can enhance the quality of education in schools. In a profession that allows one to meet many people, there is also a possibility of loneliness unless one knows how to acculturate into the team. The longer the stay in the placement school, the more the chances that the student-teacher will be able to find an entry into the group, where they will interact and learn. While teaching practice focuses on identifying the presence of skills and competencies, internship aims to support the development of the skills and competencies through positive coaching and mentoring experiences (Zugelder & Nichols, 2014).

Fourth, internship will provide the time that a student-teacher needs to engage in inquiry that includes classroom research, reflective conversations and personal analysis of performance in the classroom. Agreeing with this view, Darling-Hammond (2008) points out that many professions including Law, Medicine and Business help their students to bridge the gap between theory and practice by engaging them in inquiry, reading and writing about their practice. The same professions require that the student spends time under a mentor for guidance and assistance. The teaching profession needs to introduce this to the student-teachers if there is to be hope that the profession will grow and improve. For instance, internship will allow students to assemble portfolios that contain artifacts of teaching and learning, which they can analyze to enrich their understanding and help them better meet the needs of students.

Lastly, internship will result in the development of new relationships between placement schools and teacher training institutions. Schools usually provide sites for teaching practice and student placement for at most 12 weeks (One term) but with internship, there will be need for more time for the students in the schools. Despite this seeming disadvantage of internship, the flip side is that schools will benefit through having the cooperating teachers receiving some training as mentors. Schools will also learn from the student-teachers and their lecturers about current and emerging issues in the profession. The student-teacher will also get the chance to learn in all parts of the school and not just the classroom, a factor that will produce all round teachers who are able to participate in collective planning, decision making, co-curricular activities and even guiding and counseling.

The above reasons now lead to how the internship should be structured, in view of the Kenyan context and the ever-increasing numbers of those seeking a degree in education. First, the Universities need to structure the school experiences to take place at the end of the Bachelor of Education degree and at least for two terms to provide the required time for more than classroom assessment. The supervision should be informed by the need to provide formative assessment that will improve the student-teacher rather than for certification purposes. Additionally, the assessment should extend to other areas of school life. Second, the teacher training curricular should include inquiry skills that will enable the student-teacher inquire alone or with others and continue to be a lifelong learner. Third, teacher-training institutions should reach out and form partnerships with schools in order to offer training and other guidance to cooperating teachers to enable them assist student-teachers. It is such mentors and master teachers that should be committed the task of working with the students in the absence of the faculty. At this level it is important to consider the implications of this re-conceptualization on several stakeholders.

Implications

The re-conceptualization of teaching practice as internship has bearing on three groups of people: first are the policy makers in the education sector. Given the extended duration of the school experience and additional responsibility on schools, education officials should ensure the teacher-training syllabus is structured to accommodate this new aspect. The second group is that of placement schools who now have to contend with having student teachers for a longer time and will be required to do more in the preparation of these prospective teachers. The third group is the faculty and tutors in schools of education who have to shift their focus from summative evaluation of their students to more formative assessment that is intended to prepare and not necessarily to judge.

Conclusion

From the above discussion, it is clear that the component of teaching practice is key to the preparation of an effective teacher who will facilitate learning and also be a learner, in this century. Despite its central role, teaching practice as it is now structured exhibits elements of inadequacy especially in terms of the time taken to link theory and practice in a school experience. It is because of the identified reasons and others that the paper has proposed a re-conceptualization that will result in an extended period in the school, more of formative assessment rather than just summative assessment, inclusion of the component of inquiry and collaboration among schools and institutions that train teachers. Like Gujjar (2009), the authors of this paper agree that teaching practice is a milestone in the endless journey of teaching and so how it is structured and executed should be a matter of careful thought. The benefits of an internship like school experience far outweigh the challenges, especially when the student-teacher feels well prepared and is positive that the principal, colleagues and the cooperating teacher view him/her as better prepared, then there will be less attrition and a better profession.

References

Coolahan, J. (2002). *Teacher Education and the Teaching Career in an era of Lifelong Learning.* OECD Education Working Papers no. 2

Darling-Hammond, L. (2000). How Teacher Education Matters. *Journal of Teacher Education.* 51(3). P.166-173.

Darling-Hammond, L. (2008). Constructing 21st Century Teacher Education. *Journal of Teacher Education.* 57(3). P. 300-314.

Gujjar, A. A. (2009). Teaching Practice: concepts, stages, objectives and suggestions. Available at www.articlesbase.com/college-and-university-articles

Hussain, Inshad, Mahmood, & Tariq (2010). Practice Teaching or Internship: Professional Development of Prospective Teachers through their Pre-service Training Program. *Journal of Educational Research.* 12(1). P.105

Nemser, S.F. (1983). Learning to Teach. In Akers, L. and Mathews, J. (Eds.). *Handbook of Teaching and Policy.* New York: Longman Inc.

OECD (2001). *Teachers for Tomorrow's Schools: Analysis of the World Education Indicators*. 2001 Edition.

Zugelder, B. & Nichols, J. (2014). Student Teaching Handbook: A guide for Internship and Clinical Practice. Available at http://www.education.ucf.edu/clinicalexp