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Building capacity: challenges and opportunities in large class pedagogy (LCP) in Sub-Saharan Africa

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Abstract Over the past 20 years most countries, particularly developing countries, have seen a large increase in the number of students seeking higher education. A consequence of this growth is increasing pressure on teaching staff and institutions, usually resulting in, among other effects, increased class size. Large classes of between 300 and 1,000, and even more, at the undergraduate level are not uncommon in a number of countries (Mulryan-Kyne in Teach High Educ 15(2):175–185, 2010). Large classes are often perceived as one of the major obstacles to the attainment of quality education. Despite the difficulties associated with teaching and learning in large classes, they remain a reality in many countries affecting learners across all levels of the education system and are often the only perceived option available to meet growing demand for higher education in Sub-Saharan Africa (Mohamedbhai in 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, 2008). We contend that the challenges of delivering large classes can be confronted, and in many ways diminished, through the use of current and emerging technologies and enhanced faculty development. In this expository paper, we present findings from project activities focused on higher education faculty development and capacity building. The findings include both formative and summative development activities, as well as data collected in faculty professional development workshops and the results of two surveys. We use these data to lay out issues, challenges (e.g., skills, resources, logistics—including poor campus infrastructure), and opportunities (e.g., mobile capacity, distance tools such as *Moodle*) of large class pedagogy using a design-based research framework.

Keywords Large class pedagogy · Technology · Design-based research · Mobile learning · Universal design for learning · Learning management systems

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Introduction

Over the past 20 years most countries, particularly developing countries, have seen a large increase in the number of students seeking higher education. This phenomenon has been called the *massification* of higher education and has occurred globally (Mohamedbhai 2008). A consequence of this growth is increasing pressure on teaching staff and institutions, usually resulting in, among other effects, increased class size. Large classes of between 300 and 1,000, and even more, at the undergraduate level are not uncommon in a number of countries (Mulryan-Kyne 2010).

Large classes are often perceived as one of the major obstacles to the attainment of quality education. Biggs (1999) observed that the practical problems faced by students and instructors increase and change in nature as class size increases. Researchers have found that student motivation, perceived learning and teacher sensitivity are factors commonly affected by large classes. Large classes inhibit students' opportunities to receive feedback and interaction with other students and teachers. Carbone and Greenberg (1998) found a general dissatisfaction among students related to large classes. Despite the difficulties associated with teaching and learning in large classes, they remain a reality in many countries, affecting learners across all levels of the education system and are often the only perceived option available to meet growing demand for higher education in Sub-Saharan Africa (SSA) (Mohamedbhai 2008).

The notion of large classes is often paradoxical in the context of a networked world where globalization is changing the nature of international commerce—a phenomenon often referred to using Thomas Friedman's (2007) term "flat world." The paradox is that the reasons that make sense for large classes in the immediate African context are at odds with an increasingly global job market. This is an *industrial* model of instruction that is possibly already obsolete in the world economy, and this raises questions such as: Does large class pedagogy de-emphasize critical thinking and problem solving that are advocated in models of twentyfirst century skills, and what is the trade-off between the quantity of students served in large class contexts versus the quality of education they receive? At a curricular level, are there points where large classes make more sense than others? In the United States' model of higher education, large classes are typically lower-level undergraduate courses; general education classes and more advanced classes tend to be smaller, providing opportunities for more engaged models of learning.

Another paradox is that while developing and delivering large classes offers access to education to more students (and more revenue potentially to universities), the practice risks *de-professionalizing* faculty members. There is tremendous potential to erode faculty members' autonomy and job security, as well as contribute to the narrowing of the curriculum—especially by limiting instruction as constrained by technology and reinforcing particular pedagogic methods that reflect certain understandings of learning (Foley 2003). This echoes earlier critiques and concerns of distance education. Consider that courses are *developed* by tenure-track faculty members only to be delivered routinely by adjunct instructors or part-time instructors in a gradual process of standardization and deskilling. When the content of the curriculum is constructed independent of the instructor, its content and perspective are easier to control and more reliably delivered to students. At the same time, a standardized curriculum makes fewer demands intellectually on the professor. Hence, the university may employ less qualified, and subsequently, less expensive faculty members to teach more students. Hornsby and Osman (2012, personal communication) note:

> Nevertheless, there is increasing pressure in many countries to enroll as many students as possible in tertiary education. This is because of the clear link between tertiary education, health, empowerment and economic development (Bloom et al. 2005; OECD 2008:4; World Bank 2012). Bloom et al. (2005:16) argue that tertiary education can lead to both private and public benefits for a country. Private benefits are seen in the rise in employment prospects, incomes and ability to invest and save money. This leads to improving productivity since tertiary education is tied to overall better health and longer life expectancies.

We contend that the paradoxes of delivering large classes can be confronted, and in many ways diminished, through the use of current and emerging technologies and enhanced faculty development. In this expository paper, we present findings from project activities focused on higher education faculty development and capacity building. The findings include both formative and summative development activities, as well as data collected in faculty professional development workshops conducted at Kenyatta University, near Nairobi, Kenya, in October 2011 and June 2012 and the results of two surveys—one of Kenyatta University faculty members and another of SSA universities. We discuss the context of our work and our use of a design-based research framework. We then discuss challenges and opportunities in large class pedagogy and use the data we collected to lay out issues, challenges (e.g., skills, resources, logistics—including poor campus infrastructure), and opportunities (e.g., mobile capacity, universal design for learning, distance tools such as *Moodle*) of large class pedagogy (LCP).

Context

The Schools of Education at Kenyatta University and Syracuse University, in Syracuse, New York, USA, have had an institutional linkage since 2000 and have collaborated in a number of areas since that time, including providing professional development to teachers in a rural area in Kenya, co-hosting an international conference on education every 2 years starting in 2009, and having around 20 graduates of Kenyatta University pursue graduate studies at Syracuse University. In 2011, the two universities were awarded a partnership grant funded by the United States Agency for International Development (USAID) through the Africa—US Higher Education Initiative. The USAID-funded Kenyatta University–Syracuse University (KUSU) partnership is focused on building capacity in teacher education through professional development for faculty members, program and curricula review and revision, and collaborating with educational stakeholders to improve teacher preparation and development.

One of our first partnership activities was to conduct a survey of all of the Department of Educational Communication and Technology faculty members at Kenyatta University to gain baseline data on a variety of teaching and learning issues; included among these issues were class size, supporting all learners, and integrating technology into teaching. Twenty-one faculty members completed the survey. The respondents identified large classes as one of the top two concerns related to teaching the teacher education courses; the other top concern was the need to review and revise course curricula. All but one ($\sim$95 %) of the respondents reported that classes are too large while all but two ($\sim$90 %) noted that tutorials are too large. Tutorials are discussion groups that are smaller than the lecture that meet once a week; each student is assigned to a tutorial for the course. Due to the faculty members' responses on this issue, we chose to address teaching and learning in large

classes for our first workshop sponsored through the Kenyatta University–Syracuse University partnership.

Design-based research framework

Because the KUSU partnership is focused on capacity building in the areas of faculty professional development, program and curricula review and revision, and collaboration, we employed an approach based on design-based research methods (DBR). DBR is the systematic study of designing, developing and evaluating educational interventions. In educational research, DBR is an empirical technique that involves designing interventions with goals and objectives, testing them, evaluating the results, then refining or adjusting the intervention (Cobb et al. 2003).

Design-based research not only focuses on the summative effect of an intervention, as most traditional research does, but also aims to advance knowledge about the characteristics of such intervention as well as the process of design and development (van den Akker et al. 2007). Such a shift in research emphasis helps to generate "usable knowledge" (Design-Based Research Collective 2003, p. 5) that speaks directly to the problem of practice. The DBR process is comprised of interrelated and iterative phases, as illustrated in Fig. 1.

A DBR project seeks to understand how an intervention operates in an authentic situation through a process of problem identification, theory development, intervention design, iterative implementation and coordination with participants, feedback, revision, evaluation and reflection. DBR narrows the gap between education research and actual practice by conducting research in situ, where hypotheses and interventions are observed and data collected in a situated environment, rather than in a laboratory setting. The benefit of this practice is to advance the external validity and authenticity of *what works* in an environment where research controls are difficult and transfer to practice (Walker 2006).

Design-based studies are interactive, iterative and flexible. They require interactive collaboration among developers, users, and practitioners, and without such collaboration, interventions are unlikely to affect changes in the real-world context (van den Akker 1999; Wang and Hannafin 2005). Design studies are often time-consuming because designs and interventions tend to be continuously developed and refined through an iterative design process from analysis to design to evaluation and redesign. However, the ongoing, recursive nature of the design process also allows greater flexibility than do traditional development approaches. The design, development and implementation of KUSU project innovations was conducted using a DBR framework comprised of interrelated and iterative phases involving faculty, staff, and students from both institutions.

In this project, observational and survey results were used to develop a series of faculty development workshops focusing on topics related to the use of technology in instruction with an emphasis on LCP. Baseline measures of faculty skills and interested were used to

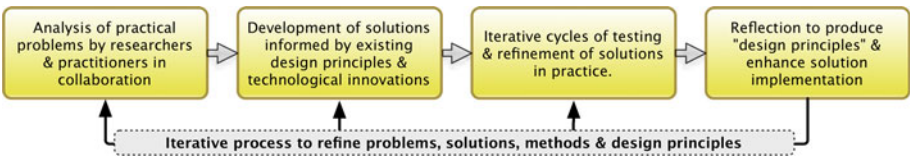

Fig. 1 The design-based research process (adapted from Amiel and Reeves 2008)

identify instructional topics and design workshops. Evaluations and observations from each round of workshops, and consultations with KU faculty, guided the development of subsequent workshops focused on technology skills, with an emphasis on integration of technology in teaching (see Fig. 2).

Training sessions engaged participants in a balance of presentations and hands-on explorations. Some sessions involved technology in teaching. One session engaged teacher educators in thinking carefully about ways of integrating technology in their teaching and supporting prospective teachers in using technology in their teaching. Using tablet technology in instruction was the topic for another session, where teacher educators explored different apps and functions of tablets that could be useful in teaching teachers and supporting these teachers teaching of students. Another session engaged teacher educators in using the University Design framework to make learning as accessible as possible for all students, and creating accessible media for use in teaching. Online learning and strategies and techniques for using learning management systems engaged participants in another session.

Other sessions involved technology in scholarship. One session engaged faculty members in developing a web presence through creating profiles in Google Scholar and Academia.edu in order to create an online identity and connect with scholars across the world in areas of interest. Another session was about designing effective presentations. We also had some sessions on basic technology, such as assistance with any email, word processing, or navigation questions.

Challenges and opportunities in large class pedagogy

In this section, we discuss issues impacting large class teaching identified in survey and workshops with faculty. Our understanding of both the challenges facing faculty teaching large classes and also the opportunities to build and enhance these classes evolved over the course of multiple iterations of workshops, observations, and evaluation.

Collecting data to inform planning

Large class pedagogy consists of instructional approaches used by instructors to teach classes with many students; in public universities in SSA this often means classes with 400–1,000 students. In October 2011, we had a workshop at Kenyatta University to look at the issues and challenges associated with large classes. Faculty members raised a number of issues:

- Is it possible to support students in developing teaching skills in large classes?

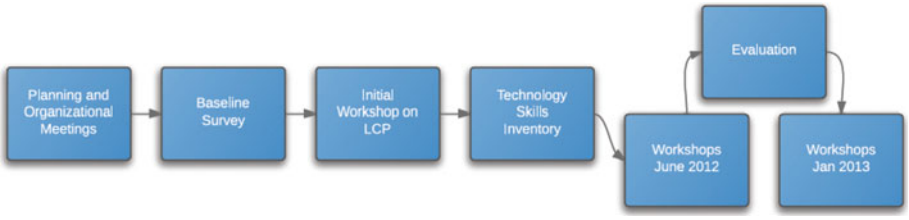

Fig. 2 DBR flow for capacity building with KU faculty members

- Will resources, such as technology, be available?
- Can an instructor mark (grade) all of the papers in a large class and meet the university deadline when marks are due?
- How can an instructor give students feedback in a timely manner, both while teaching and after marking?
- How can an instructor monitor student attendance and understanding during a lesson?
- How can learner dissatisfaction be minimized in large classes?
- How can cheating be minimized during exams?

These issues point to the challenges faced by instructors in wanting to teach effectively and reach all students.

Workshop participants also discussed issues and challenges related to students and their learning needs in large classes. These issues included that (a) students may feel emotionally distant from the instructor and course content, that they can hide in a large class, and that their needs may not be met, leading to frustration; (b) below and above average students may be left out as lecturers may tend to focus on the average learner; (c) there may be inadequate availability and access to resources; (d) there may be inadequate exposure to hands-on experiences; and (e) there may be a lack of feedback from the instructor. These indicate the difficulties that students may face in large classes and point to the challenge of providing a conducive learning environment in this situation.

These are all valid issues and challenges that faculty members must consider and have strategies for coping with them. In the same workshop, Kenyatta University faculty members proposed a number of possible strategies, including (a) engaging students actively in class through an interactive lecture combined with some group discussion; (b) use a learning management system, such as *Moodle*, to give students some content prior to class, (c) agree with the class on instructor and student responsibilities, (d) assign students to share information in class, and (e) divide the class into project groups and give assignments for the groups. In general, the strategies proposed the instructor working together with the students to create a learning environment that engages students and keeps them involved in learning.

These proposed strategies may have implications for changes in the classroom culture, the amount and nature of content covered in a course, and/or the preparation of instructors. For example, the strategy of engaging students actively in class through an interactive lecture combined with some group discussion may mean that the classroom norm of the instructor lecturing and students copying notes that is often found in SSA universities will need to change. Coinciding with this change may be a change in the amount of content and the focus of content included in a course. Frequently engaging students in group discussions may mean that some content will be covered in more depth than through lecturing only, and the breadth of the content covered in a course may be reduced. These are the pedagogical trade-offs that instructors must decide on, balancing quality and depth of learning against coverage of course content. Being able to meaningfully engage students actively in discussing conceptual ideas may also require support and training for faculty members. Pedagogical moves such as preparing and engaging students in discussions are quite different in nature from preparing and delivering lectures. Faculty members will likely find it difficult to teach in a manner different from how they were taught without support and professional development.

Regarding strategies for students to use in coping with the challenges of large classes, the faculty members recommended that students (a) maximize use of available resources; (b) learn to share resources among classmates; (c) take more responsibility for their

learning; (d) form study groups; (e) seek assistance from academic advisors and mentors; and (f) apply learning styles appropriate for large classes (e.g., collaborative learning, participatory learning). Instructors would need to discuss and support these learning strategies for them to be effective.

The faculty members also generated some suggestions for use at the department level: (a) have a student desk where students can go for consultation and advice; (b) have a departmental website where course descriptions and information are posted; (c) use master's students to monitor during exams and assist in marking; and (d) allow instructors to schedule the exams during the semester rather than have them be scheduled by the university.

As an outcome of the workshop, participants recommended, in a policy brief to the university central administration, that (a) more faculty members should be hired; (b) existing lecture halls be equipped with LCD projectors and multiple screens so that all learners can see visual displays, and Internet connectivity should be upgraded; and (c) faculty members should have ongoing opportunities for professional development to build capacity in integrating technology and developing effective pedagogical approaches, such as incorporating polls (clickers) or small group discussions as part of interactive lectures for teaching large classes. These important recommendations will take commitments in these areas from the university in order to be actualized.

As part of our partnership project we wanted to learn if instructors in other universities in SSA were also trying to cope with large classes, and if so, what strategies they were using. Thus, as one of our project activities, we surveyed universities in SSA regarding class size and strategies for teaching large classes. Using the Internet, we developed a list of universities that fit our criteria and searched for email addresses of deans of Schools of Education, or academic administrators if we were not able to find the email address of a dean of a School of Education. We amassed a list of 70 people and sent them a link in October 2011 to our survey that was available on SurveyMonkey™.

The survey asked six questions: (1) what type of college or university is the institution (public or private), (2) how many undergraduate students are enrolled at the institution (<5,000; between 5,000 and 10,000; between 10,000 and 20,000; between 20,000 and 30,000; more than 30,000), (3) what is the average class size in undergraduate courses (<50; between 50 and 100; between 100 and 300; between 300 and 500; more than 500), (4) does the institution have any undergraduate courses that have more than 200 students (yes or no), (5) what strategies do faculty members use to teach large classes effectively, and (6) if the respondent knows of faculty members at the institution who are able to teach large classes effectively would the respondent be willing to give an email address for us to follow up.

We received 10 responses to our survey, from one private and nine public institutions. We speculate that unreliable or slow Internet access and perhaps our message going to email accounts that are not checked regularly contributed to a response rate of $\sim$14 %. Three of the schools enroll more than 30,000 students, while two enroll between 20,000 and 30,000, two enroll between 10,000 and 20,000, and three enroll <5,000 students. Four schools reported that their average undergraduate class size is between 300 and 500 students, one school reported between 100 and 300, four schools reported between 50 and 100, and one school reported an average class size of <50 students. We found that large classes were taught primarily through lectures, which were sometimes conducted via radio and other times by use of public address systems in large halls.

Respondents listed a variety of teaching strategies—some that had already been generated in the Kenyatta University workshop, and others, such as using (a) supplementary

teaching/learning materials; (b) collaborative/team teaching; (c) pod casting; (d) tutorial support; (e) clickers; (f) postgraduate students as tutors; (g) materials with active textual engagement; (h) multimedia; and (i) parallel activities where students choose from a menu of options. Faculty members at Kenyatta University have discussed many of these as strategies they want to work on implementing. As discussed previously, these strategies may involve changes in the classroom culture, in the nature of the course content, and in support and training for instructors.

We could envision collaborative teaching happening with planning and support as Kenyatta University often has several faculty members assigned to an introductory education course or a methods and curriculum course. Currently, the faculty members split up the teaching, taking turns for different topics. Teaching collaboratively would require a different way of looking at the act of teaching and of providing learning opportunities for students.

Clickers or polls that can be completed by students sending text messages (e.g., http://www.polleverywhere.com) can be ways of engaging students actively during classes. For example, an instructor can prepare questions for students to answer with clickers or text messages that allows the instructor and students to see the variety of opinions held by students about some topic, or the understanding that students have about a particular concept. The instructor can then use these responses in discussing the content of the lesson.

The strategy of having parallel activities where students choose from a menu of options would require a different type of planning on the part of instructors. If an instructor decided to use this strategy for a particular lesson, instead of preparing a lecture to be delivered to all students, the instructor would prepare several activities (e.g., a reading followed by small group discussion, preparing a lesson plan for a particular topic in a small group) from which students would choose. While students work on these activities in class, the instructor would walk amongst the students, facilitating small group discussions, asking questions of students to prompt their thinking, and assessing the learning that is occurring. These strategies are the type of professional development activities that faculty members will need in order to be prepared to use these instructional approaches, as well as support in engaging all learners so that learners below and above the average are actively engaged, along with average learners, which lecturers tend to aim toward.

Accessing resources and enhanced infrastructure

Leveraging technology to facilitate LCP requires instructors comfortable with technology and infrastructure to support the integration of technology into their teaching practice. Physical spaces used for LCP require permanent and reliable infrastructure such as Internet access, projector(s), and audio amplification. Instructors using these spaces need to be trained on the use and troubleshooting of these spaces and need to be able to rely on consistent and easily accessed technology support in case something is not working properly.

The use of technology to facilitate LCP is also dependent on campus technology infrastructure. Infrastructure can include everything from the campuses connection to the Internet, the local area network or (LAN), services such as email, and a course management system, such as *Moodle*. Campus infrastructure presents a fairly easily fixed problem; however, it is one with some cost. We believe it is possible and probably beneficial for tertiary institutions in Africa to *leapfrog* universities in Western countries by not creating large, complex wired networks and instead focus on developing wireless and mobile capacity on their campuses.

During professional development workshops at Kenyatta University, we discovered that accessing the Internet via mobile data networks using USB modems was much faster than trying to use the campus wired network. We originally planned to set up a wireless router and connect it to the campus network; however, the campus network could not support this.

Another issue we encountered while conducting these workshops was that there was not a ready supply of spare parts and peripherals on hand. One byproduct of increased and sustained technology use is a stockpile of spare parts and other resources—things taken from broken computers or outmoded technology. In many US universities, items such as computer speakers are a commodity. They often come with the computer and when the computer is replaced the speakers are set aside and usually not needed because a new set comes with a new computer.

The challenge we observed at Kenyatta University is that the university is yet to develop technology logistics. In this sense, logistics means the procedures, activities, or organizational systems that make the technology work to meet particular goals and agendas. Many of these technology logistics are fairly bureaucratic—institutional processes for checking in and checking out equipment, and for managing equipment. These processes are important if an institution is going to provide consistent and reliable technology infrastructure. Instructors need to be able to rely on the fact that some technology will be available when they enter a classroom, that it will be functional, and that there is a mechanism for getting assistance when needed.

We observed an interesting distinction in how faculty members at Kenyatta University communicated with each other compared with typical practices in US higher education—text message versus email. KU faculty members have become accustomed to using text messages to communicate instead of emailing. Text messages are used to organize meetings are organized and send out reminders. This is a cost effective and easy method of communication, and valuable in the sense that mobile is an area where capacity exists that can be used to support LCP (namely, as a gateway to the Internet); however, texting has drawbacks as an academic and administrative communication method. Faculty members still interact with students in fairly traditional ways—primarily in-person communication. Given the numbers of students to faculty, texting would not provide any efficiency.

Texting does not provide some of the *institutional* functionality that exists in the procedures of email use that have evolved in other parts of the world. In many Western universities, email is essentially a document delivery system and is considered an official record of communication. Email sent to students' university-provided email accounts is considered as official as paper documents sent via mail. These *official* emails serve as an institutional record—notes of conversations, documentation of communication with students, and administrative tools for scheduling meetings, etc. Email browsers and web-based services, like Gmail, allow users to sort, search, and archive email. Email distribution lists and LISTSERVs are easy to set up and maintain, and many learning management systems offer integrated class email functionality.

While in many ways the use of SMS text by university faculty members is a more sophisticated use of mobile technology than one might see in a US university, it does not scale well as a LCP practice. As a means of communicating with several hundred students, texting could potentially be a viable broadcast mechanism, where an instructor sends a mass message; however, the cost and logistics (SMS charges, collecting and managing phone numbers) of this would be significant. There are tools that mass broadcast SMS messages, but these require additional material and personnel support from the institution. All faculty members we worked with had email accounts both through the university and from free services, such as Yahoo and Gmail. These services essentially provide unlimited email storage space at no cost. The active

use of SMS by university faculty, and the near ubiquity of mobile devices we observed among faculty and students at Kenyatta University suggest other opportunities to enhance LCP.

Utilizing growing mobile capacity to engage learners

The use of mobile technology provides a unique opportunity to engage learners in large classes by providing alternative mechanisms for content delivery and student engagement. While campus infrastructure is being developed, mobile technology can provide an immediate stopgap solution by tapping into ubiquitous mobile/handheld technologies, to facilitate, enhance, and extend teaching and learning.

Globally, mobile network covers more territory than the electrical grid (Johnson et al. 2010). Approximately half of Africa's one billion people are not connected to an electrical grid (Zachary 2009), yet the number of mobile subscriptions is around 644 million (about 11 % of the world total). In Kenya mobile phones are nearly ubiquitous and 92 % of Internet usage is via mobile networks (Perry 2011). As of the second quarter of 2012, 7.7 million users were using mobile data networks to access the Internet—an increase of 19.2 % from the same period in 2011 (Communications Commission of Kenya 2012). Additionally, the number of Internet users overall increased by 19–14 % million users from 2011. There are roughly 43 million people living in Kenya, and there are roughly 30 million mobile phones being used by Kenyans.

As a teaching tool, mobile devices can provide instructors with access to resources that current infrastructure might not provide. Rather than being dependent on campus network infrastructure, instructors can have a mobile-enabled device connected to the Internet. Increasingly, sophisticated android and iOS tablet devices can effectively be used as presentation devices, running specialized forms versions of slideware (i.e., PowerPoint).

One way mobile can be used in LCP is to provide mechanisms for student engagement. An increasingly popular technique for engaging students in large classes is the use of Student Response Systems (SRS). These systems are an evolving technology (Judson and Sawada 2002) that allows instructors to engage students in real-time polls to gauge comprehension, ask questions, and enhance interaction. Traditionally, student response systems have been proprietary and relied on infrared or radio-frequency systems where students must purchase or rent input devices. Mobile technologies offer possibilities for large class instructors to engage students using internet-based polling services like *Poll Everywhere* (http://www.polleverywhere.com) as student response systems.

As mobile technology matures and becomes more pervasive, the way we think about software itself is changing. Whole industries are adjusting to a new technology ecosystem where sophisticated but easy to use software tools routinely sell for less than US$1. In contrast to the model for desktop applications that stack feature upon feature in a one-size-fits-all approach, mobile apps are small, simple, and elegant. They generally do one thing, or a small list of tightly related things, extraordinarily well.

Using universal design for learning in large class pedagogy

One of the areas KU faculty members identified for focus as part of the capacity building and program development through the USAID project was teaching all learners. The effective use of technology in large class pedagogy can have the benefit of facilitating practices of universal design for learning (UDL), offer better access for students with disabilities, and effectively teach all learners. Universal design for learning is not dependent on technology, nor does the use of technology itself mean that instruction is universally designed; however,

technology makes Universal Design an easier process. Universal Design was originally developed in the fields of architecture and design as a method of designing more broadly accessible spaces and products. The term *universal design* describes the design of products that consider the needs of the broadest range of users from the outset and maximizes usability of products, services, and environments, for everyone. Universal design for learning (e.g., Rose and Meyer 2006) draws on universal design and is intended to improve access to education and educational materials through the use of three principles (Rose and Gravel 2012). *Principle I—Provide Multiple Means of Representation* offers students different ways to access course content, or "what" they are learning. Often large classes only utilize didactic lecture. Universal design encourages instructors to vary ways that new information can be presented to students. *Principle II—Provide Multiple Means of Action and Expression* suggests that there are different ways for students to demonstrate their mastery of course content other than exams (assessments), the "how" they are learning. *Principle III—Provide Multiple Means of Engagement* Universally designed instruction offers students more ways can be engaged in their learning and motivated to learn.

Another benefit of UDL is that it strengthens the social and cultural relevancy of instruction and instructional materials by allowing students to engage with content in different contexts and media. Universally-designed curricula and materials present material in multiple ways and offer students different options for engaging with and responding to content. In addition, UDL encourages the provision of multiple ways for students to find meaning in the material and thus motivate themselves. By encouraging multimodal instructional techniques and by pushing instructors to rethink delivery methods UDL also makes good use of a variety of technologies.

Emerging mobile instructional tools also offer possibilities for integrating UDL into LCP. Apps like Educreations (http://www.educreations.com/) and Doceri (http://doceri.com) allow an instructor to present material on a projector in a large class, record the lecture they are giving with the content being projected, and save a video recording of the projected images and the live lecture. These videos can then be uploaded into a Course Management System (CMS) and be available to students who might not have been able to see or hear all aspects of the lecture presentation.

Expanding use of course management systems

Through its Institute of Open, Distance and e-Learning (ODeL), Kenyatta University operates a free, open source e-learning software platform called *Moodle*. *Moodle* is an example of a well-established category of technology tools generally referred to as learning management systems (LMS), course management systems (CMS), or virtual learning environments (VLE). While often thought of as tools for online or distance classes, there are a number of uses for an LMS in a large class. LMSs provide tools to help administer large classes by automating functions previously done by hand. For example, *Moodle* can be used to keep and calculate grades, share class resources (syllabi, notes, and readings), and administer and grade quizzes. LMSs are best suited to routine and objective tasks such as calculating grades, distributing readings, posting notes.

Conclusion

Large class pedagogy can be an effective and efficient approach to addressing the need for increased access to tertiary education in SSA in ways that foster skills students will need in

a global, "flat world" context. The use of technology can make large class pedagogy more efficient and more meaningful for learners. In this paper, we have explored opportunities to build capacity in LCP predicated on the efficient use of emerging technology, faculty development and support, and enhanced infrastructure.

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