



Trainings and Recommendations on Supporting Students with Visual Impairments Using Assistive Technology

**Kenyatta University and Syracuse University*:
Africa-U.S. Higher Education Initiative Partnership**

Building Capacity Through Quality Teacher Preparation

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Visual impairments (VI) present challenges to quality education for students with VI in many ways. At a fundamental level, many of the learning strategies used by sighted students who can see two-dimensional representations of both objects and processes are not possible for students with VI, and common instructional approaches tend to be visually based (e.g., writing on a chalkboard). People with visual impairments continue in 2014 to have limited access to textual information, the most prominent example being books. The World Blind Union estimates that blind people in developed countries have access to less than 5% of the world's published material in an accessible format, and that people in developing countries have access to less than 1% of published material in an accessible format.

Kenyan Context

According to the Kenya Union for the Blind, approximately 518,000 Kenyans (or roughly 1.4% of the population) are visually impaired. This includes 15,500 visually impaired children. In 2009, two public universities in Kenya began admitting students with VI. In 2014, there are now approximately 50 students with visual impairments at Kenyatta University (roughly half are low-vision and half are blind). Because students do not have access to assistive technology and do not develop proficiency using these tools, they are often viewed as having limited competency/ability. Providing access to assistive technology early and consistently throughout a students' schooling builds both their

skill and confidence and also demonstrates the abilities of people with VI to the larger society.

Research Study

As part of our partnership project, one of the research studies we undertook was to examine the impact of iOS devices (in this case, iPads and keyboards) on students with VI in a university setting. In this research study, we used interview, observation and follow-up email data to address the following research questions: (a) How do communities of practice develop among students with visual impairments?; (b) What supports and infrastructure are necessary to effectively develop communities of practice in using mobile devices as assistive technologies in resource-limited environments (RLEs)?; and (c) What is a model for the successful implementation of communities of practice using mobile devices and assistive technologies in RLEs?

This study was a design-based research (DBR) intervention that used an iterative process to ensure its efficacy. DBR is an empirical technique that involves designing interventions with goals and objectives, testing them, evaluating the results, then refining/adjusting the intervention. DBR not only focuses on the summative effect of an intervention, but also aims to advance knowledge about the characteristics of such intervention as well as the process of design/development. As part of this process we collected data through interviews, observations, and follow-up email

with the 20 students who have been trained in the use of the iOS devices at Kenyatta University.

In June 2012, our team worked with four KU students with VI (blindness and low-vision). We provided the students with iOS devices, keyboards, and trained them to use the built-in iOS visual access functions. By our fourth meeting, the students had made great progress in mastering the apps on their iOS devices and were creating documents, downloading music, recording videos of things to listen to, listening to text, taking photos of documents and creating optical character recognition (OCR) documents.

In January 2013, we provided 10 more students with devices and the students from June 2012 played a key role in training the new students. Within two days, all of the students were checking and sending email messages, listening to music, checking Facebook, along with reading and creating documents using the assistive technology. In January 2014, we provided six more university students with devices and a student from the original group served as a trainer.

The 20 students we have worked with thus far come from across Kenya. A few of the students come from urban areas (e.g., Nairobi, Thika, Nakuru), but most of them are from rural areas, and some are from fairly remote areas, such as Turkana and Samburu in northern Kenya, Garissa in northeastern Kenya, Narok in southern Kenya, and Busia in western Kenya.

We utilized iOS devices and external Bluetooth keyboards (for enhanced utility). The refined and consistent user interface and robust, built-in access tools make these devices easy to use and deploy. There is a large and sophisticated global community of iOS users who are blind. An iPad can serve as a screen reader, display large or high contrast text (even magnify print), recognize and describe colors, and connect to the Internet via Wi-Fi or GSM mobile networks. Additionally, there are a significant number of apps developed by and/or for people with visual impairment available on the iOS platform and a robust user community.

The cost, user interface, built-in accessibility features and global community of iOS users with

visual impairments make iOS devices (in particular, iPad mini) our device of choice. While iOS devices initially cost more than other mobile platforms (i.e., Android), these devices are a fraction of the cost of specialized, dedicated assistive technology tools (e.g., a screen reader installed on a laptop).

We used open coding to establish codes for data that appeared able to help us answer our research questions and then used axial coding to look for patterns and make sense of the data. From our data analysis, we have the following findings:

- ***Finding #1: Access to Education***

All of the 20 university students who have received an iPad mini and keyboard have expressed very clearly how the devices have given them access to education at a level comparable to their fully-sighted peers. Prior to having the devices, the students would either carry heavy Braille machines to class (if one of a few machines was available from the library) and take notes that way (having to purchase the expensive paper themselves) or find someone in the class to later read the notes to them as they studied for an exam. With the iOS device, the students either record the lecture and listen to it later, or take notes by typing with the keyboard.

- ***Finding #2: The Means to Participate in Everyday Life***

Having assistive technology like an iPad mini, allowed our participants to be able to participate in everyday life in many of the same ways that their sighted classmates do. Within a day or two of having one of these iOS devices, the students were making use of all types of social media. Our participants also learned very quickly how to use the Internet capabilities of their mobile devices to interact with information available via search engines and online communities

- ***Finding #3: The Opportunity to Create a Community of Practice***

Even prior to having iOS devices, the university students with visual impairments were close knit, working together to orient new students to the campus, students with low vision assisting blind students with walking

across campus, and keeping in communication with each other by phone or in person. When we introduced the first four students to the iOS devices in June 2012, we realized at our second meeting with them, by hearing the students' conversations among themselves, that many of their classmates with visual impairments were also learning how to use the devices through this group of four students.

When we worked with 10 additional students with visual impairments in January 2013, all of them came into our first meeting having some knowledge of using an iOS device because they had learned from one of the four students in the first group. This community of practice has developed through the interest of the students who have learned how to use the iOS devices and want to assist and support other students with visual impairments in having the same access to education and the means to participate in everyday life. The community of practice is sustained through members sharing with each other new things they have learned on their iOS devices and asking each other questions as they find the need to know something beyond what they currently know.

Findings from this research work suggest that communities of practice are both a viable and a valuable approach for facilitating the diffusion and support of mobile devices as assistive technology for students with visual impairments in resource-limited environments. A primary challenge we have faced is in meeting demand. As a community of practice of mobile assistive technology use has developed at the university, we have noticed that many students with visual impairments who have never had access to assistive technology recognize the potential of this technology and are eager to use it. We hope to provide access for more students while building a demonstrable, sustainable model for broader use. Providing access to assistive technology early and consistently throughout students' schooling builds both their skill and confidence and also

demonstrates the capabilities of people with visual impairments to the larger society.

We hope to continue and expand this work using mobile technologies with students with visual impairments, scaling the project to meet the needs of a large and underserved population. The first phases of this expanded work began in July 2013 as we provided four iOS devices and keyboards and worked with secondary students and teachers at Kibos Primary School for the Visually Impaired. In January 2014, we provided eight iOS devices and keyboards and worked with secondary students and teachers at Thika Secondary School for the Blind. We returned to Kibos with 11 more iOS devices and keyboards and to Thika with three more iOS devices and keyboards, and provided training to students with VI and their teachers. Providing access to this technology at all levels of schooling for students with visual impairments will create the synergy necessary to affect changes in social and cultural view of disability.

Based on the research and training we have done in this project, we make the following recommendations:

- **Recommendation #1:** Efforts for technology implementation and integration from the Kenya Ministry of Education should include students with special needs as a top priority.
- **Recommendation #2:** Students with visual impairments at all levels should have access to mobile technology that supports screen readers. The most appropriate technologies currently are iOS devices.
- **Recommendation #3:** Universities and the Ministry of Education should work with foundations and other funding sources to supply meet the need of supplying individual students with visual impairments with mobile devices with screen readers.

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