Unlocking Potential for Enhanced Teaching and Learning of Students with Visual Impairment in Uganda’s Public Universities: the role of Assistive Technologies

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Abstract

Enrolment of students with visual impairment (SVI) in Uganda’s universities is increasing amidst limited awareness and capacity of educators to effectively support their learning despite the existence of policies aimed at improving their learning. Makerere University in partnership with Kyambogo University; the National Council for Higher Education and the Uganda National Association of the Blind is implementing a project to address the staff capacity constraints to support SVI in two public universities in Uganda.

The goal of the project is to build capacity in public universities to provide an inclusive teaching and learning environment for the SVI through effective usage of assistive technologies. The project adopted a combination of a qualitative interpretivist and Design Based Research to analyze the contexts in which public universities provide education to SVI; and secondly, to train staff in using selected assistive technologies to support the teaching and learning of SVI. A Situational analysis was conducted from three public universities with a sample of 29 students with visual impairment, 17 teaching staff, 09 academic leaders (Dean and Heads of department) and 18 administrative staff.

A three-week blended online training was developed based on the data from the situational analysis and offered to 40 academic staff from two universities. The trained staff are implementing action points from the training in their practices. SVIs in the two universities have also been oriented to the assistive technologies. The paper shares preliminary findings from the project.

Key words: Inclusive education practices, students with visual impairment, assistive technologies
**Background**

Inclusive education is imperative in today’s increasingly globalized and polarized world as it contributes to social equity, justice and more peaceful societies (UNESCO, 2014; Morelle & Tabane, 2019). Inclusive education recognizes diversity among learners socially, culturally, physically, and mentally and is premised on the view that all children should learn together regardless of differences, including disability (UNESCO, 2009; 2014). The notion of inclusivity in education implies recognizing and minimizing barriers to accessing quality education and effective participation in learning experiences by all learners regardless of their status and life circumstances.

Inclusive education has been promoted by several international protocols, including the World Declaration on Education for All (1990), The Salamanca Statement and Framework for Action on Special Needs Education (1994), the Dakar Framework for Action (2000), the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in 2006 and recently the UN Sustainable Development Goals (SDGs) in 2015. With respect to inclusive education, Article 24 of UNCRPD requires countries to attain a right to education for persons with disabilities without discrimination and on the basis of equal opportunities at all levels of education. SDG4 in particular promotes equitable and inclusive quality education and lifelong learning opportunities for all, and Target 4.5 requires ensuring equal access to and effective participation at all levels of education for the vulnerable groups, including persons with disabilities. Additionally, target 4.A requires education to be disability sensitive and for learning environments to be safe, non-violent, and inclusive for all.

Uganda has ratified various international conventions and protocols that safeguard the rights of PWDs, including the right to education such as the UN Universal Declaration of Human Rights; the UNCRPD; the Salamanca Statement and Framework for Action on Special Needs Education, and Marrakesh Declaration (2013). In addition, national legal and policy frameworks including the Constitution of the Republic of Uganda (1995), the Special Needs and Inclusive Education Draft Policy (2011) require an inclusive educational environment for all categories of people with disabilities.

Despite the global and national commitments to inclusive education, barriers to inclusion and full participation of PwDs persist in Uganda (UNICEF, 2013). For example, the proportion of PwDs that have never been to school in Uganda at 31% is more than twice that of non-PwDs at 13%. Similarly, education attainment at tertiary level is only 3.7% for PwDs compared to 7.1% for non-PwDs at the same level (UBOS, 2019).

This paper focuses specifically on students with visual impairment (SVI) at Uganda’s public universities. Visual impairment (low vision and blindness) is the dominant form of disability in Uganda reflected among 7.2% of persons aged 5 years and above (UBOS, 2019).

**The problem**

This main problem the project addresses is inadequate awareness and capacity of educators in universities to effectively support learning of learners with visual impairment. Statistics show that the number of students with visual impairment (SVI) enrolled in Uganda’s universities, especially in schools and faculties of education, law and the humanities is increasing. Yet research shows that many educators teach and design learning activities as if all the learners in the audience are sighted. For example, many write on the board when teaching, distribute handouts and set questions with drawings in tests and examinations, among others (Sikoyo et al, 2019) all of which disadvantage SVI. Unless educators in universities are well prepared and oriented to recognize and modify their teaching to support the special requirements and learning styles of SVI, these students are likely to continue experiencing learning problems when they join universities, constraining their full participation in university education. This will in turn affect achievement of the Constitution of the Republic of Uganda and Article 265 of Vision 2040, all of which call for education for vulnerable people, including persons with disabilities. It further undermines global commitments on inclusive education and achievement of the UN 2030 Agenda for inclusive and sustainable development reflected in the SDGs 1,4,8 and10.

UNESCO (2009) advocates for flexible and innovative teaching approaches and equipment as well as the application of ICTs as one of the strategies for enhancing inclusive learning environments. Technology offers multiple means for learners with visual impairment to complete work with greater ease and independence (Eligi & Mwantimwa, 2017; Gambo, Adelokun, Gambo & Afolayan, 2021, Roberts, et al, 2008). Assistive technologies for individuals with disabilities include assistive, adaptive and rehabilitative devices (Reed & Bowser, 2005) as well as software that improve their access and participation in different aspects of life. Assistive technologies promote functionality, autonomy, independence, quality of life, and social inclusion for person with visual impairment (Alves, et al 2009; Nyaga, Nguyen, Imonje, 2017; Siu & Emerson, 2017). Assistive technologies such as screen magnification and text-to-speech screen reading software, braille, large print books, CCTV, audio books...
and podcasts enhance the learning environment for learners with visual impairment (Ahmad 2015; Amponsah, 2021; Lintangsari & Emaliana, 2020; Simui, et al., 2019).

Technologies, particularly assistive technologies have great potential for adapting learning environments to enhance learning for the visually impaired (Ojok, 2018, Lintangsari & Emaliana, 2020, Simui, et al, 2019), however there is limited research on the utilization of assistive technologies to support the teaching and learning of SVI in universities in developing country contexts like Uganda (Hewett, et al, 2017). In addition, there is little research on how educators can ensure inclusive teaching of students with visual impairment (Omede, 2015, Lintangsari & Emaliana, 2020) as well as a dearth of studies on interventions implemented to promote inclusive education in various cultural settings (Amor etal, 2019, Moriña, 2017, Khalil & Hantira, 2022). This paper contributes to this research gap.

**Purpose and objectives**

The main purpose of the broader project is to strengthen the capacity of educators in Uganda’s public universities to effectively integrate and use assistive technologies in their pedagogic practices in order to enhance learning and independence of SVI. This paper reports on the project’s findings relating to two aspects, namely;

1. Capacities of academic staff to support the inclusive learning of SVI, including their level of awareness and utilization of specialized assistive devices and technologies;

2. Preliminary lessons from the staff and students’ capacity development initiative in integration of assistive technologies to support learning of SVI.

**Research design**

The project is being implemented by Makerere University in partnership with Kyambogo University, a key player in Special Needs Education; Uganda National Association of the Blind, an umbrella organization for the Blind and National Council for Higher Education, the national regulator for universities and tertiary institutions.

The project adopted a combination of qualitative interpretivist and Design Based Research (DBR) to analyze the contexts in which public universities provide education to SVI; and secondly, to train staff in the use of selected assistive technologies to support the teaching and learning of SVI in two public universities.

In order to gain a better understanding of the teaching and learning context for SVI in universities, the team designed a situational analysis study that adopted a case study design and employed interviews, focus group discussions, document analysis and non-participant observations as data collection methods. Data was collected from three public universities that enrol SVI, from a sample of 73 respondents comprising 29 students with visual impairment, 17 teaching staff, 09 academic Dean and Heads of departments and 18 administrative staff.

Data from the situational analysis was qualitatively analyzed and generated themes in line with the project objectives. The findings guided design and implementation of a training programme to address the identified capacity gaps and needs of staff in inclusive teaching and assessment of SVI, including use of assistive technologies.

After the training, the project team identified six committed staff to pilot action points from the training in their courses for at least six weeks, and to reflect and document lessons from the pilot phase to inform improvements in future iterations. The team provided the staff a template to document their reflections during the testing phase which is ongoing till end of May 2022.

**Findings**

**Staff capacities in supporting learning of students with visual impairment**

This section presents study findings on capacities of staff in supporting SVI in relation to orientation received; awareness and sensitivity to the learning needs of SVI; adaptations in teaching and assessment; awareness and usage of specialized equipment and technologies; and capacity gaps and needs.
Orientation in supporting SVI

With the exception of staff from the Faculty of Special Needs and Rehabilitation (SNR) at Kyambogo University, the rest of the sampled staff had not received any form of orientation in teaching or supporting SVI. In addition, Departments and Faculties did not have any centralized system for orienting staff to the special learning needs of these students. Without orientation, the staff took personal initiative to support the students in the best way they could, drawing on different sources of information and using empathy.

Awareness and sensitivity to learning needs of SVI

The findings show that staff across the three universities did not receive prior information about SVI, consequently they have first encounters with the students in class and others in the course of invigilating examinations. The staff recognized the students by their brailing, those who took the front seats in class and when they come to their offices after class requesting for support. The staff said they particularly found difficulties recognizing SVI in large classes unless the students identified themselves and requested for support. Students with low vision were the most difficult to recognize compared to those totally blind. The low levels of awareness about the SVI were attributed to information gap between the central administration units supporting students with disabilities (such as admissions and welfare units) and the academic units.

Staff at Makerere and Kabale universities reported limited awareness of the types of visual impairment, the nature of support required by each category and how to provide the support. A mixed picture emerged at Kyambogo University, with staff based at the faculty of SNR reflecting more awareness and sensitivity to SVI than their counterparts in other faculties.

Adapting teaching and assessment processes

The study also sought to understand how staff adapted teaching and assessment processes to support SVI. The staff accounts presented a mixed picture: the staff with expertise in special education were sensitive to the learning needs of the SVI and provided a wide range of adaptations in their teaching and assessment practices. For example, prior to class, one lecturer plans the seating arrangements such that those with low vision occupy front seats, and another provides the students with summarized notes in advance to enable them to follow the lesson.

During class interactions, the staff use mixed grouping, pairing SVI with their sighted peers for support during group tasks. They also use various teaching strategies and resources to address the different learning needs and styles in the class. For example, they verbalize all teaching activities, including what is projected by the LCD to benefit blind students, and ensure they are audible enough. They also provide students with low vision large print materials.

The majority of the sampled staff were considerably sensitive to the students’ learning needs but had limited capacity to adapt their teaching and assessment practices to effectively support SVI learning. For example, one female lecturer from Kyambogo University explained that although she is not familiar with handling SVI, she tries to engage them in class discussions and ensures she is not too fast for their pace. She also avails soft copies of learning materials and asks those needing further support to consult her after class. A female lecturer from Makerere University reported that she shares soft copies of learning materials with the SVI, follows up on the students and generally attends to cases as they emerge as ‘expected of social workers’.

On the other hand, some staff taught in a mainstream way, making minimal effort to adapt their practice to supportive the SVI. The following extracts are illustrative:

So, we always teach the normal way …..I would say I have not done much to deal with these SVI so I have continued to teach in the mainstream way. In an exam, rarely do we think about the boldness and font of the exam script. It is always the Dean to remind us of this in case we forget.
(JL, Male lecturer, Makerere University)

Now we are treating them in a standard way – we are not practicing equity -we are not doing what we are supposed to do to support them and it is out of ignorance.
(MD, Male lecturer, Kyambogo University)

With the exception of staff from Kyambogo University’s Faculty of SNR all sampled staff across the three public universities said they found it particularly challenging to teach concepts involving non-verbal illustrations such
as graphs, tables, symbols or formulae, yet these were critical concepts in the curriculum. Consistent with the staff perspectives, the students reported that they found course units with graphics, symbols and mathematical calculations particularly difficult to follow when no adaptation or alternative formats were provided.

**Awareness and utilization of specialized equipment and technologies.**

The study assessed the level of awareness and utilization of specialized equipment and technologies by staff teaching SVI. In terms of awareness, all staff across the three universities were aware of some specialized devices and technologies used by SVI such as JAWS, braille machines and audio recorders, although most said that they did not know how these devices were used. Staff at the Faculty of SNR were familiar with a wide range of specialized equipment such as embossing machine, Perkins Braille machine, Braille slate, stylus, CCTV, magnifying glasses for low vision users as well as screen reading software like JAWS. This was unsurprising given their background in special education and disability studies. The staff recognized that technologies change rapidly and hence they need to update themselves with newer technologies.

In relation to use of specialized devices and technologies to support SVI, a varied picture emerged within and across the universities. The majority of the sampled staff from Kabale and Makerere University did not integrate any specialized equipment and technologies in their teaching because their universities had limited access to these resources. The exception were staff from Kyambogo’s Faculty of SNR who had access to a fairly well-equipped resource centre with specialized assistive devices and technologies. One of the lecturers at Kyambogo said that he occasionally conducts lessons in the resource room and also refers students to the unit for support in brailing learning materials or converting these into audio format.

With minimal access to specialized technologies and equipment majority of staff said they used generic equipment like LCD projectors and laptops for power-point presentations, and whiteboards. They also used E-mail and WhatsApp to communicate and to send learning materials to the students. Two staff said they used internet and YouTube to search for teaching materials. One of the lecturers at Makerere pointed out challenges in using generic technologies for teaching SVI this way:

‘We use LCDs, we don’t have any specialized equipment and we are already getting lots of feedback from students complaining asking how they can cope, and that they don’t fit into the online learning’.

Unlike the foregoing account, one of the Kyambogo University staff explained that when he uses an LCD projector he ensures that students with low vision sit in front, and that he voices out whatever is projected for the blind students.

Consistent with staff accounts, students at Makerere University reported that lecturers mainly used LCD projectors for teaching and emails and WhatsApp for sending them notes. The students explained that lecturers who used LCD projectors tended to teach at a very fast pace and rarely explained pictures and other graphics in PowerPoint presentations, which negatively impacted their comprehension.

Makerere and Kyambogo universities adopted online learning for continuity of learning during the COVID-19 lockdown. Three staff, one from Makerere and two from Kyambogo reported that they used ZOOM and their institutional Learning Management Systems (LMS), i.e., Makerere University E-learning Environment (MUELE) and Kyambogo University Learning Management System (KELMS) for teaching. Students said they mainly used the LMS to access learning materials although some found the LMS incompatible with some screen reading software, as recounted by one SVI who said, ‘We also hear that talk back is not comfortable with MUELE’.

Zoom video conferencing technology gained popularity during the Covid-19 lockdown. Some students at Kyambogo and Makerere said they had used Zoom for classes during the lockdown although this was only accessed by students who had computers, laptops and smart mobile phones and those who could afford data costs too.

**Capacity gaps and needs of staff in supporting students with visual impairment**

The study finally sought to assess the capacity gaps and training needs of staff in relation to supporting SVI. The main challenges staff experienced in teaching SVI for which they sought training included; how to adapt instructional materials to suit the students’ needs, how to teach and assess mandatory concepts like symbols in language, formulae, statistics and those involving graphical and tabular illustrations, exposure and basic knowledge in using specialized equipment and technologies like braille machines and software like JAWS. Several lecturers wished to learn some basics in brailing. Despite their expertise and experience, staff at
Kyambogo University’s Faculty of SNR expressed a need for continuous professional development given the dynamism in the field with respect to new technologies and new approaches in inclusive education.

There is a tendency to treat persons with disabilities as a group and yet each impairment has specific needs. Persons with low vision require different technologies and adaptations of learning materials and tasks, different from the totally blind just like persons with hearing impairment require different support systems. The staff asked for orientation to the different types of visual impairment, information on learning needs of the different types of SVI and the adaptations necessary for each category. In addition, the staff called for general exposure to inclusive education and how to communicate and teach the students in a manner that builds their self-confidence and esteem. Other capacity gaps and needs included access to specialized equipment and how to use these to create a conducive learning environment for the students.

Students accounts during the FGDs indicated that they appreciated lecturers who show concern and follow them up when they are absent from class and those mindful about their sitting arrangements in class; those who provide them soft copy notes via email and those who used specialized equipment and technologies to adapt teaching and learning processes and materials. Students from the Faculty of SNR at Kyambogo University cited an example of a CCTV that displays projected information in large font to enable those with low vision learn more effectively while use of tactile learning resources enable the blind to touch and feel which facilitates their understanding of concepts.

On the other hand, SVIs at Makerere University were concerned about lecturers who were insensitive to their learning needs by using inappropriate teaching and assessment practices and inaccessible learning resources. For example, students reported that some lecturers used graphs, calculations, tables and statistics without providing adequate explanations, others issued only printed handouts, and taught and ‘dictated’ notes in a fast-paced manner. In addition, students complained that some lecturers did not seem to know the university examination regulations on adapted formats for questions and answer sheets and extra time allowed for SVI. Student resented the idea of using sighted guides to write their examinations.

The students suggestions called for improving the overall environment in public universities to enhance their participation, including more awareness and sensitivity to their learning needs through the policies, regulations and the teaching and learning process and support systems. These suggestions were consistent with the study findings on the low levels of awareness, staff sensitivity and capacities to support SVI’ learning, as well as inaccessible physical facilities and learning resources.

**Staff Capacity Development Intervention**

The findings from the Situational analysis study guided the team to design and implement a five-module course to address the capacity gaps and needs of staff in inclusive education practices, including the use of assistive technologies.

The project had originally planned to hold face to face training workshops for the staff. However, the Covid-19 pandemic social distancing restrictions compelled the team to adopt a blended mode of training and postponed the practical components of the programme till early 2022 when physical meetings were possible for more than 20 persons. The online course was implemented over three weeks from September to mid October 2021. 40 staff from Makerere and Kyambogo universities participated in the training.

The course was implemented asynchronously using the Makerere University LMS and synchronously via Zoom. For each module, the project team designed interactive learning activities and resources on the LMS and also scaffolded participants’ learning during the week. In addition, one 3-hour live session was held each week via Zoom for participants and facilitators to meet synchronously to review and consolidate learning from the modules. Some SVI from the two universities were invited to some of the Zoom sessions to share their lived experiences of learning and how they can be further supported by the staff.

Additionally, the project procured a set of specialized equipment and assistive technologies comprising four desktop computers and two flatbed scanners fitted with an off-the-shelf screen reading and magnification software (Fusion) and optical character recognition (OCR) software to convert print material into digital format. These technologies have affordances to enhance accessibility of learning environment and resources to support SVIs with low vision and the totally blind.
The project also organized practical orientation workshops to expose staff and SVI to the specialized equipment and technologies in each of the two universities- Makerere and Kyambogo. Although the project is still in progress there are already some promising results in terms of raising awareness on the needs of SVI in the participating universities, more agency and advocacy by the SVI for accessible learning environments and resources and strengthening of staff awareness and competencies in inclusive education practices.

## Conclusion

This study established the preparedness of public universities in Uganda to provide education to students with visual impairment and to strengthen capacities of educators in universities to support the learning of SVI using assistive technologies. This study has shown that overall learning environments in the three public universities were largely inaccessible for SVI which implies a low level of preparedness of the universities to provide education to SVI. The study further revealed that despite having institutional policies and regulations on disability, the universities lacked clear policy implementation guidelines to support teaching and learning of students with disabilities. Some physical facilities for learning including lecture rooms, venues for other academic activities and online learning environments were not accessible for SVI.

In addition, the study has revealed staff capacity challenges and gaps in relation to inclusive pedagogic practices which further constrained accessibility of the learning environment for SVI. The findings showed minimal awareness among staff of the role and use of assistive technologies in teaching and learning of SVI and most teaching units at the universities did not have access to specialized equipment, devices and technologies for adapting instructional materials to support SVI’ learning.

The findings of the current study are consistent with earlier research in Sub Saharan Africa and the developing world (Muzata et al, 2020; Simui, et al 2019; Omede, 2015; Ibrahim 2001; Fuller, 2004), that report barriers to inclusion and participation of SVI in higher education contexts relating to inaccessible learning environments and staff capacity constraints for inclusive teaching approaches and inadequate specialized equipment and technologies (Namugenyi & Wamea, 2021; Fichten, etal, 2020; Wandera, et al., 2017; Emong & Eron, 2016; Emong, 2014). The capacity development intervention for staff has promising results on the role of assistive technologies in inclusive participation of SVI in higher education in developing contexts like Uganda.

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