Library Information Resources Accessed by Visually Impaired Learners using Assistive Technology at the Zambia Library Cultural and Skills Centre for the Visually Impaired (ZLCSCVI) in Lusaka District, Zambia

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ABSTRACT

This study investigated the library information resources accessed by visually impaired learners at the Zambia Library Cultural and Skills Centre for the Visually Impaired (ZLCSCVI) in Lusaka District of Zambia. The objective was to establish the useful library services accessed by persons with visual impairment at ZLCSCVI using the available assistive technology. A qualitative approach was employed to address the issues involved. The Case study design was used for data collection and analysis. The study population consisted of all instructors of assistive technologies and visually impaired learners at ZLCSCVI. The sample comprised 3 instructors and 17 visually impaired learners at that institution, a total of 20. Purposive sampling was used to select the participants. Data were captured using: A technology checklist, focus group discussion guide and an observation schedule. Then, it was analysed thematically. The study revealed several Assistive technologies available for visually impaired learners at ZLCSCVI. The most popular ones were JAWS, followed by NVDA which enabled learners to hear through the speakers what had been displayed on the screen. These technologies helped the learners to access useful academic materials such as books for lessons in all subject areas, solutions to assignment questions, e-mail messages, WhatsApp messages for socialisation etc. The findings implied that pedagogical strategies used by instructors of the visually impaired learners should include suitable assistive technologies such as JAWS and NVDA in order to help the VI learners perform like sighted peers. From the results it was concluded that the main assistive technologies used by the visually impaired learners at ZLCSCVI were JAWS and NUDA. These technologies enabled learners to access academic materials like books and non academic materials from computer storage media such as hard drives, CD ROM drives and flashes. In view of the above conclusions the following recommendations were made:

- ZLCSCVI should consider procuring more assistive technology, particularly JAWS and NUDA to help more learners who are visually impaired access all the required library information resources at ZLCSCVI
- All the staff at ZLCSCVI should undergo training in the use of assistive technology such as JAWS and NVDA so that they guide students effectively in how to use such technologies so as to enhance learning.

Keywords: Assistive Technology, Information resources, Visually Impaired learners. JAWS and NVDA.

INTRODUCTION

Background and Context

For many years now, the number of learners becoming visually impaired in the world has been increasing at an alarming rate (Hasselbring and Glaser, 2000). According to global statistics, every minute that passes, approximately one child goes blind, making a total of about 500,000 children who go blind each year worldwide (World Health Organisation- WHO, 2012). In the United States of America alone, the number of school children who are blind is estimated to be more than 485,500 (National Federation for the Blind -NFB, 2012). The problem in that area has been worsened by some school going children getting involved in tobacco consumption which

has potential to affect the eyes (Gazmararian et al., 2007). In Africa the situation isn't different, especially with the problem of HIV Aids which has resulted in more people losing their sight. Lupiya (2017) indicates that Zambia has the highest rate of blindness in Southern Africa with over 105,000 learners who are visually impaired. These learners are underprivileged because in many cases they do not have proper access to important resources. Therefore, they require special education and relevant assistive technologies to achieve their fullest academic potential (Ministry of Education-MoE, 1996; Lupiya, 2017).

Use of assistive technology by learners with visual impairment is also supported by United Nations Educational, Scientific and Cultural Organisation, UNESCO (2008), which contends that technological innovations can help level the playing field for the visually impaired persons. The European Union (2002) adds that the usage of electronic information and Communication technologies has become a powerful tool for learning because they offer learners with sight problems opportunities to gather a wide variety of resources and information that enables them to share their thoughts and ideas with others in collaborative learning environments.

In view of the above, computer experts in the world have developed several assistive technology software packages for visually impaired learners (Dolphin Computer Access, 2017). Examples are: Job Access with Speech (JAWS), Microsoft Office Suite, MSN Messenger, Corel, Adobe Acrobat Reader, Internet Explorer, Firefox, and many more applications that are used on a regular basis on the job and in school.

In Zambia it is rare to find any of the above assistive technology software packages, except at Zambia Library Cultural and Skills Centre **(**ZLCSCVI, 2013). The library is located at Plot No. 4225, Chilimbulu Road, Chilenje, Lusaka. It was a donation from the Finnish Federation for the Visually Impaired (FFVI) in 1993. Since then, the Centre has been receiving a monthly grant from the government through the Ministry of Community Development and Social Services. It is registered with the Zambia Agency for Persons with Disabilities under Act 0.33 of 1996 and Technical Education and Vocational Training Authority (TEVETA), because it has a Computer Centre where visually impaired learners undergo training in how to use assistive technology (Makondo and Akakandelwa, 2017). One of the primary objectives of the library is to impart to visually impaired persons among other things, computer literacy skills so that they can use assistive technologies fully for their academic benefit and in any other way they would want. According to Mandal (2013) training of this nature in the use of assistive tehnology by the visually impaired persons is important because it is the main impetus through which their education can be achieved easily. If access to such training in ICT is denied, it may be difficult, if not impossible, to bring such learners into the mainstream of development (Cennamo et al, 2009; WHO, 2013).

While it is good for the visually impaired learners to undergo training in the use of assistive technology at Zambia Library Cultural and Skills Centre **(**ZLCSCVI) to access and grasp various resources, research does not show the library information resources accessed by the visually impaired learners using assistive technology in the Zambian context. Hence, this study investigated this issue.

Statement of the problem.

Research shows that assistive technology is helpful to all learners worldwide, including those with physical disabilities (MOE, 1996). This is why learners with low or no sight in Zambia are encouraged to use assistive technology in their learning (UNESCO, 2008). In view of this, ZLCSCVI in Lusaka provides training to visually impaired learners in the use of assistive technology so that they can be in a position to access and grasp various library information resources on computers. However, research does not show the library information resources accessed by the visually impaired learners using assistive technology in the Zambian context. This creates a gap in knowledge which calls for a systematic investigation. Hence, this study.

Research objective

The objective of the study was to:

Establish the useful library information resources accessed by persons with visual impairment at ZLCSCVI using the available assistive technology

REVIEW OF LITERATURE

The aim of technology is to improve the lives of human beings. Persons with visual impairments are no different and require the use of assistive technology (AT) to compensate for their vision loss (Nguyo, 2015, p. 45). In fact, all students with visual impairments are entitled to the independence and efficiency afforded by assistive technology. Appropriate assistive technology enables them to access information and to complete tasks efficiently, thereby enabling them to achieve the highest level of independence possible.

Emerging research suggests that assistive technology promotes acquisition of literacy, provides more equal access to information required for employment, and for access to information, in general, and facilitates social and community networks (Kelly and Smith, 2011; Butterworth et al., 2011; Sarstedt, 2011) determined that there were three primary issues facing individuals with visual impairments: access to information, independent travel, and a lack of meaningful experiences. Assistive technology is used by individuals with visual impairments to compensate for these limitations. Assistive technology can enable students who are visually impaired to achieve educational success and gain competitive employment by providing tools for increased independent access to information and for effective communication (Kelly, 2008; Calder, 2010)

According to the European Union (2002) the usage of technology has become a powerful tool for learning as it offers students with visual impairments opportunities to gather a wide variety of resources and information that enables them to share their thoughts and ideas with others in collaborative learning environments, networked through the Internet. Usage of computers for communication and networking activities via the internet has expanded the learning environment beyond the walls of the classroom and allows the visually impaired learners, to access and send information around the world.

When a computer is fitted with any assistive technology such as: JAWS, window eyes, virtual magnifying glass, ward talk, Non-Visual Desktop Access, Thunder, Web Anywhere, Zoom Text and Soretek among others, it becomes accommodative to a person with visual impairment. He or she can use it for reading, writing, doing assignments, socializing with others on Facebook or email and searching for any new information on the internet. For example, screen enlargement software allows the students to easily read and see what is on the monitor, especially those with poor eyesight. The talking software on the other hand reads the text appearing on the screen for the visually impaired student hence making access to information easier and education possible (Tomei, 2003).

According to D'Andrea and Presley (2009), learners with visual impairments function independently in various activities with appropriate assistive technology. Having a personal computer acts as a backbone in one's life as it supports a visually impaired user to independently write, edit documents, send and receive e-mails. It creates efficiency and independence to a student with visual impairment who has skills to use it. Therefore, equipping a computer with assistive technology for visually impaired learners serves as a backup for the learners' brain.

The literature above supports the fact that persons with disabilities in various parts of this world find appropriate assistive technology very useful in learning and life in general. However, literature does not specify useful library information resources that are accessed by the visually impaired learners in the Zambian context. Therefore, the visually impaired learners in our country may use technologies without knowing how it will benefit them. Worse more, instructors of the visually impaired can neither encourage the VI learners to use particular assistive technologies nor discourage them because to do so they also need to know the usefulness of such technologies. This problem needs to be addressed seriously if such learners have to use appropriate technologies for their academic and social benefit.

METHODOLOGY

The study used a qualitative research approach and a case study design to collect and analyse data. The research site was ZLCSCVI in Lusaka District. This site was chosen because it had the required participants who were to provide critical data. The research population comprised all learners with visual impairments and assistive technology trainers at ZLCSCVI. The sample consisted of 17 learners and 3 trainers of assistive technology, a total of 20; Homogeneous purposive sampling technique was used to select the trainers. Research instruments

were : A technology checklist, observation schedule and a focus group discussion guide. Permission was given by the School of Education to conduct research at ZLCSCVI. Final permission was obtained from the officer in charge at ZLCSCVI. Then, the Researchers met participants and administered the instruments. Validity was achieved by allowing experts to go through the instruments during the pilot study while Reliability was achieved by using the test-retest method during the same time. In order to achieve trustworthiness, findings from different instruments were triangulated, rival explanations were considered for the same issues and there was prolonged engagement and persistent observation. Qualitative data were analysed thematically. The study used the **Miles** and **Huberman** (1994) model of the **thematic analysis process**. The analysis was done in three link stages or 'streams', namely: data reduction, data display and data conclusion-drawing/verifying. Its main limitation was the design used which could not allow generalisation of findings to a larger context. In the study, there was voluntary participation, anonymity was respected and consent forms were signed.

In order to assess how blind learners would **access and use resources** such as: Word documents, e-books, PDFs, websites, learning platforms etc through **assistive technologies such as JAWS or NVDA**, the evaluation criteria focused on the **accessibility of the resource itself** and the **effectiveness of its use through assistive software.** First, the researcher checked if the resource was **technically accessible**, meaning if it worked well with screen readers, used the right file formats (such as accessible PDFs, Word, or HTML), had proper headings and structure, and followed accessibility standards. Second, she checked if the **content was readable** – this means if the text was clear, images and diagrams had descriptions, tables and charts were labeled correctly, and the learning materials were provided in accessible forms. Third, she checked if the resource was **usable**, allowing learners to move easily between sections, search for information, adjust reading settings, and get helpful feedback if they make mistakes. Fourth, she checked if the resource could support **effective learning** by helping students study independently, complete tasks more quickly and accurately, understand complex ideas, and stay engaged. Fifth, the researcher checked if the resource could fit well into **teaching and classroom use**, making it easier for teachers to prepare lessons, enabling blind and sighted students to work together, and being fair to use in tests and assessments. Finally, she checked if the resource would promote **equity and inclusivity**, meaning if the resource worked both online and offline, and gave blind learners the confidence and independence to learn equally with others.

Instructors involved participants in accessing and using the resources while the researcher was part of the team and observed how the resources were accessed and used in class by the visually impaired learners. She took note of how the resources affected learning results and collected feedback from both students and instructors.

In the study, there was voluntary participation, anonymity was respected and consent forms were signed.

FINDINGS

The objective of the study was to:

Establish the useful library information resources accessed by persons with visual impairment at ZLCSCVI using the available assistive technology

Findings from Technology Instructors

In the questionnaire, instructors of technology were asked several questions regarding useful library information resources accessed by visually impaired learners at ZLCSCVI using the available assistive technology. Their responses indicated that JAWS and NVDA enabled learners to access academic materials such as e-books, websites, simulations, PDF documents and other materials in all subjects, music for entertainment, WhatsApp for socialisation, E-mail for communication, Word documents for writing assignments, spreadsheets for calculations and all other things which the sighted peers accessed on computers

They made the following narratives:

I1: "Our students use JAWS and NVDA to access academic materials such as books and other kinds of literature both academic and non-academic." These technologies manage to do so by reading aloud what is displayed on

the computer screen". Learners are able to follow e.g. if the VI is typing or calculating something on the computer he/she is able to hear whatever is displayed on the screen."

I2: "At ZLCSCVI, JAWS and NVDA help learners with visual impairment who have been trained to use these technologies in research on academic assignments for those in secondary schools and tertiary education using the internet websites, PDF documents." In turn learners perform better in class than they do without such technologies.

I3: "JAWS helps learners at our institution to socialise, communicate and in their daily activities through e-mails, WhatsApp, Music etc.". Learners can share their experiences and help each other in many ways including school work.

It was clear from these narratives that with the help of JAWS and NVDA on computers, learners accessed various useful academic and non-academic materials and were able to communicate and socialise with each other because the assistive technology read aloud whatever the learners did on computers. This also helped instructors to ensure that teaching of whatever content they presented to learners was effective. Learners were able to access and grasp whatever was accessed because of the assistive technologies, without which this could not have been possible.

Findings from Learners

In questions 1 to 6 of the focus group discussion, all learners stated that there were assistive technologies at ZLCSCVI which they had been trained to use. The majority of them (84%) stated that most of the assistive technologies at ZLCSCVI provided useful academic and non-academic resources, as shown by the following narratives made by participants L1 to L11:

L1: "Using assistive technology, we find almost all the materials we need to move forward in our academic work. We are knowledgeable on how to search for materials on computers in time."

This point was consolidated by other respondents who gave examples of assistive technologies and the services they provided as follows:

L2: **NVDA** – When writing our academic essays (assignments) and trying to browse through PDF copies they do assist us to get the information we need because they are the ones that read aloud through the software embedded inside and then we are able to access the accurate information that we need. They act as our readers especially JAWS. "With **JAWS** am able to communicate with sighted people. When given an assignment about anything, I just type and send them to the other person with the help of JAWS" by E-mail.

L3**: Transcriber_** With the help of the transcriber I have been able to read any form of literature whether social or academic. It has helped me not to remain behind in my daily activities."

L4: **Peckin's Brailler** _ This has been useful in the sense that we are now able to type materials in our language. There is no need for a third party. We just type or calculate and read the material on our own.

L5: **Brail Notetakers** _ We are able to write any material that we want. This has really been useful because we choose what we can write and how to phrase it on our own. We write notes that are valuable and authentic in our studies."

L6: "**CCTV and Super NOVO** have been helping us to go through our work and perform just like our friends who can see by way of enlarging the text. We are able to compete just like our friends who can see in class because without its help it cannot be possible to clearly see the text."

It was clear from these narratives that with the help of assistive technologies learners were able to: access any material they wanted on computers, type academic work such as assignments, read any documents, do some calculations, write notes and communicate by E-mail.

L7 added the following, "We access all academic materials, everything that we find in the school syllabus; We access Biology, science, English, civic education, R.E, Geography, History textbooks etc; Anything school related while L8 said that assistive technologies enabled them to access modules for: psychology, curriculum studies, etc." The former was from a secondary school while the latter was from a tertiary institution. Their expressions confirmed what other learners had already stated that assistive technologies assisted learners to access academic materials.

L9 added something slightly different by saying " We get information sometimes that is in form of just illustrations on a topic may be in form of a video with illustrations and like that we get a clearer picture of what is being talked about with the help of CCTV of course". This meant assistive technologies provided material that served as visual or learning aids to learners.

The learners reiterated that the services accessed using the available technologies at ZLCSCVI were useful. L10 said " They are able to help us when studying, they read out the materials, also when typing we are able to detect mistakes with their help. But there are also times when the software cannot read certain pages online. This could mean that even though the technologies were useful, in some cases learners experienced some challenges.

L11 also added something new by saying, "Software like JAWS and NVDA have made our lives easy. There is no need to focus on braille, which is a bit involving. Apart from being easy to use and providing academic materials we also use NVDA and JAWS for socialising via WhatsApp." This meant that learners did not only use assistive technologies for academic work but also for socialising.

The researcher observed learners using assistive technology to access a lot of information on desk and laptop computers like sighted people. Computers read aloud everything that was accessed in a way for the visually impaired learners to understand. They downloaded materials in various subjects and courses and used those in their studies. When asked any question about what they accessed, learners answered as if they had no disability. They accessed music and used it for entertainment and socialised via WhatsApp. It was true that assistive technology, particularly JAWS and NVDA were very useful to learners as they enabled them to access various useful library information services as highlighted above.

Summary of findings from Instructors and learners

The study revealed several Assistive technologies available for visually impaired learners at ZLCSCVI. The most popular ones were JAWS, followed by NVDA which enabled learners to hear through the speakers what had been displayed on the screen. These technologies helped the learners to access useful academic materials such as books or notes for lessons in all subject areas, solutions to assignment questions, e-mail messages, WhatsApp messages for socialisation and many other resources on a computer.

Challenges highlighted

Therefore, like the participants earlier indicated, it was true that assistive technology, particularly JAWS and NVDA were very useful to learners as they enabled them to access various useful library information services highlighted above.

However, it was also clear from the observations and instructors' views that sustainable use of assistive software like JAWS and NVDA for blind learners was limited by infrastructure and staff challenges. Sometimes there was P**oor internet connectivity** which made it difficult to access online resources and only one qualified staff to handle the technologies competently. There was **Inadequate device maintenance** that caused software to run slowly, reducing learners' access to lessons. For JAWS which was not free, there was a **difficulty accessing or affording software updates** which in turn might have made the software less compatible with newer applications, introduced security risks, and limited functionality.

DISCUSSION OF FINDINGS

In order to answer this question, the researcher used findings from two research instruments, namely: Instructor's questionnaire and the Focus Group Discussion guide. In the questionnaire, instructors of technology, I1, I2 and I3 were asked several questions regarding useful library information resources accessed by visually impaired learners at ZLCSCVI using the available assistive technology. Their responses indicated that JAWS and NVDA enabled learners to write academic material communicate with others, do calculations, read text easily, download and interact with videos, edit work, socialise etc.

Findings from students confirmed those from instructors as the latter also indicated that assistive technology were very helpful to them. They cited JAWS and NVDA as the most useful because they helped visually impaired learners in writing academic essays (assignments) and in browsing PDF documents on the internet. JAWS also helped them to communicate with sighted people. Therefore, there was no doubt that JAWS and NVDA were very useful to learners at ZLCSCVI and that was why they were commonly used. This finding is supported by literature which stipulates that teachers use technology in the classroom only when they see that it has value in their instruction (Finley, 2003; McKenzie, 2001). If it does not, they cannot adopt it in teaching and learning. The finding is also consistent with the Technology Acceptance Model by Davies (1996) which indicates that the attitude of the user to a system, is influenced by perceived usefulness (Chuttur (2009). Perceived usefulness refers to the degree to which a person believes that use of the system will enhance his or her performance (Dholakia and Dholakia, 2004). In this case, visually impaired persons mainly used JAWS and NVDA because they believed that these two assistive technologies would help them access the required library resources so that in turn they could perform better in their academic and non-academic work.

The fact that at times there was Poor internet connectivity, Inadequate device maintenance a difficulty accessing or affording software updates and only one qualified instructor suggest that the library resources were not accessed and used fully. Together, these factors might have hindered consistent and effective use of assistive technology, reducing learners' independence and widening the accessibility gap. This is consistent with Alves (2009) who contended that Assistive Technology is applied to education of students with visual impairment; however, there was need for infrastructure and pedagogical support if such technology is to bear fruit.

CONCLUSIONS AND RECOMMENDATIONS

Using assistive technology, in particular JAWS and NVDA, the visually impaired learners were able to access all library resources which the sighted peers did access such as : e-books, websites, simulations PDF documents and other academic materials in all subjects, music for entertainment, WhatsApp for socialisation and E-mail for communication.

Recommendations

- The Zambia agency for persons with disabilities, Ministry of community development and ZLCSCVI should procure more effective assistive technology (JAWS and NVDA) for persons with visual impairment at the named college for students to have access to the required useful library resources like the non-impaired students.
- All lecturers at ZLCSCVI should undergo training in use of assistive technology so that they can be effective enough in guiding their students

Recommendation for further research

- Following the findings above, which looked promising to the visually impaired learners in the Zambian context, the researcher has embarked on another study to investigate the efficacy of assistive technology on performance of the visually impaired learners at the Zambia Library Cultural and Skills Centre for the Visually Impaired (ZLCSCVI) in Lusaka District of Zambia. It is hoped that the findings of the study will strengthen the practical implications of the current study. She recommends a further study on a larger scale, on the effectiveness of JAWS in the acquisition of academic services by the visually impaired persons in Zambia.

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