Deployment of Assistive Technology in University Libraries for Achieving Inclusive and Quality Education for Students with Visual Impairment in Enugu State.

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ABSTRACT

Students with visual impairment require assistive technologies to function independently like other students so as to acquire quality education. This study examines the need for deployment of Assistive Technology in University Libraries for achieving inclusive and quality education for students with visual impairment in Enugu State. Specifically, the study identifies the assistive technology available in university libraries in Enugu State; extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State; and extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State. Descriptive survey design were adopted for the study. Population for the study comprises 228 librarians from NAL, UNN and ESUT, Library. Total enumeration technique were used. The study employed observation checklist and Structured questionnaire to collect data from the respondents. Mean and standard deviation were used to analyse data collected. The study founds out that, there is inadequate assistive technology in ESUT, Library, and somewhat adequate in NAL, UNN. That's notwithstanding, there were low deployment of assistive technology by Librarian for achieving inclusive and quality education for students with visual impairment. The study also founds out that, if adequately deployed, assistive technology has the potentials of facilitating inclusive and quality education for students with visual impairment. The study recommends that, the university libraries should source for funds from the parent institution and NGOs to acquire assistive technology to meet the information needs of students with visual impairment.

Keywords: Assistive Technology, Visual impairment, Inclusive education, Quality Education, University Libraries, Librarians.

INTRODUCTION

Visual impairment limits students from accessing, retrieving and utilising information resources and services in university libraries like their counterparts who are normal students, hence, affects the achievement of inclusive and quality education in Nigerian Universities. However, deployment of assistive technologies has the potentials to make them function independently like other normal students so as to achieve effective inclusion and acquire quality education.

University libraries are libraries established, funded, managed and attached to university institution for the sole purpose of providing information resources and services to meet the information need of students and staff in teaching, learning and research activities of the university and achieve quality education. Omeluzor, Dolapo, Agbawe, Onasote and Abayomi (2017) opines that, University library is an established and organised arm of a university with a clear mandate to provide relevant and up to date information resources that meet the information needs of its users. Similarly, Nyakweba, Muwangu and Sendikadiwa (2020) defines university library as any library established in university institution to provide information

materials to its community with an aim of supporting the teaching, learning and research endeavours.

University libraries are the lighthouse of information service provision, an important component of any educational institution, and hub of learning activities where students, researchers, and teachers can explore the vast amount of information resources procured by the library. Uzoigwe and Onwubiko (2014) opines that university libraries are central to the functions of the universities and contribute to the overall development of the society through its provision of relevant information resources and services that are necessary for sustaining the teaching, learning, research and public service. The university library is an academic library that is located in a university to serve primarily the students, staff and the community at large. University libraries are expected to provide information resources and services to all the students in the university both the normal students and those with visual impairment.

Vision has an essential role in human socio-economic progress. For children, good eyesight plays a pivotal role in learning and psycho-motor development. A visually impaired person often has his or her potential stunted. Visual impairment affects many people, without age, gender or race predilection. Visual loss has several causes. Globally, at least 2.2 billion people are suffering from one form of visual impairment or another, out of which over 1 billion are treatable or preventable (World Health Organisation, 2022). This 1 billion visually impaired people include those with moderate or severe distance vision impairment or blindness due to unaddressed refractive error (88.4 million), cataract (94 million), age-related macular degeneration (8 million), glaucoma (7.7 million), diabetic retinopathy (3.9 million), as well as near vision impairment caused by unaddressed presbyopia (826 million) (World Health Organisation, 2022; Fricke, et al., 2018)

In terms of regional differences, the prevalence of distance vision impairment in low- and middle-income (LMIC) countries is estimated to be four times higher than in high-income countries (World Health Organisation, 2022). With regard to near vision, rates of unaddressed near vision impairment are estimated to be greater than 80% in developing countries while comparative rates in high-income industrialised nations are reported to be lower than 10% (World Health Organisation, 2022; Fricke, et al., 2018). The Nigeria National Blindness and Visual Impairment Survey (NNBVIS) reported that approximately 4.25 million adult Nigerians were visually impaired (Blaise-Okezie, Ihem-Chijioke, & Ewunonu, 2015). The authors further states that, up to 82% of the visual impairment in the survey were treatable or preventable with uncorrected refractive errors and cataract predominating. Both hospital-and population-based studies by Nwosu et al. (2022) in Southeast, report that visual impairment is common among children and adolescents.

Visual impairment includes low vision which if not appropriately corrected would have adverse effects on learning and other activities of daily living. Low vision refers to vision loss to such with marked limitation in visual capacity in a person to such a degree as to qualify the individual for an additional support. Blindness and low vision could result from either disease, trauma, congenital or degenerative conditions that cannot be corrected by conventional means such as refraction, surgery or medication. Visual impairment refers to vision loss of a person to such a degree as to qualify as an additional support need through a significant limitation of a visual capacity; resulting from either disease, trauma, congenital or degenerative conditions among others that

cannot be corrected by conventional means such as refractive correction or medication (Blaise-Okezie, et al., 2015).

Vision has an essential role in a child's development, and a visual deficit is a risk factor not only for altered vision-sensory development, but also for education and overall socio-economic status throughout life (Ngwoke, Aneke, & Ibiam, 2018). Globally, the leading causes of vision impairment in children and adolescents could be congenital or acquired, example are cataract, glaucoma, uncorrected refractive errors, trauma, nutritional deficiency (vitamin A deficiency), infection, corneal opacity (World Health Organisation, 2022). Adetoro (2012) describes students with visual impairment as those individuals with an ophthalmological challenge. That is, they are the students with little or non-functional vision. Consequently, one or more parts of their eyes become damaged causing loss of vision. The overall effects of visual impairment on individual can be remedied through effective use of assistive technology.

Assistive technology refers to any device or technology that helps people with disabilities accomplish tasks that would be difficult or impossible otherwise. This technology has helped individuals with different types of disabilities, including blindness or visual impairments to perform their daily duties like reading, writing, and participating in social activities. Assistive Technology (AT) includes a range of technologies which enable people to build upon their abilities and participate as fully as possible at home, school and in their community (DFID & UKAID, 2010). The use of assistive technology should not be viewed as an activity, but rather as a means of achieving goals (Scotia, 2016). The International Classification of Functioning, Disability and Health, defines assistive products and technology as any product,

instrument, equipment or technology adapted or specially designed for improving the functioning of a person with a disability (International Classification of Functioning, Disability and Health, 2014).

If there is any group of individuals who need quality education, the visually impaired should be in the fore front. The Federal Republic of Nigeria in her National Policy on Education states that every Nigerian child should have equal educational opportunity to maximise his/her potential irrespective of the child's peculiar characteristics such as giftedness or impairment of any form. Every human being needs a good vision and impaired vision can lead to poor performance. Education is an instrument that makes learners gain access to knowledge, skills and information that will prepare them to contribute to community and national development. It is often seen as a tool that can be used to reduce poverty, improve the lives of individuals and transform societies (Grubb, and Lazerson, 2014).

Inclusion is a philosophy and practice that supports the rights of all children, regardless of their abilities or dispositions to participate actively in everyday activities within their communities. The principle of inclusion according to UNICEF emphasises active participation of children within the natural environment of their community (UNICEF, 2013). In relation to education therefore, inclusion specifically focuses on accommodating all students in normal or regular education programmes. Inclusive education is further define by Ozoji, Unachukwu and Kolo (2016) as educational practices which make provisions for functional and effective learning and training for all learners within all settings most readily available to them. The philosophy behind inclusive education is that every child is important and can contribute meaningfully to the development

of the society if properly trained together with their peers. It is therefore a form of capacity building process with defined principles. The principles of inclusive education, according to Ozoji, Unachukwu and Kolo (2016) were that every child and family is equally valued and deserves the same opportunities; all children learn in different ways; and education is a child's right and not a privilege.

Providing an inclusive education to all is necessary because it is linked to human, economic, and social development. This is in response to the advocacy of Dakar Framework on Education for All (UNESCO, 2000). Failure of any education system to provide an inclusive education for all students may not only lead to an educational underclass, but also a social and economic underclass which has serious consequences for societal growth, development and sustenance. The provision of quality and inclusive education for students with visual impairment can never be achieved without adequate access and utilisation of information resources and services. On the other hand, visual impaired students cannot access and utilise information resources and services without assistive technology in the university libraries, hence, the need to examine the deployment of Assistive Technology in University Libraries for achieving inclusive and quality education for students with visual impairment in Enugu State.

Purpose of the Study
This study examines the need for deployment of Assistive Technology in University Libraries for achieving inclusive and quality education for students with visual impairment in Enugu State. Specifically, the study seeks to:
1. Identify the assistive technology available in university libraries in Enugu State;

2. Examine the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State;
3. Ascertain the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State;

Research Question
The following research questions guides the study:
1. What are the assistive technology available in university libraries in Enugu State;
2. What is the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State;
3. What are the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State;

Literature Review
In the 21st century, there are many types of assistive technology for people with visual impairment. Some of which are braille displays, screen readers, magnification software, audio books, video magnifiers, talking calculators, electronic braille writers, braille watches, Talking GPS, talking thermometers, talking clocks, color detectors, speech-to-text software, Closed circuit television (CCTV), smart glasses, braille labels, portable braille note takers, braille reading machines, optical character recognition (OCR) software, and text-to-speech software. Alabi, and Okiki, (2022) identifies the most common types of assistive technology to include braille displays, screen reader, screen enlargement

software, screen enlargement, text to speech, and voice recognition software. Omekwu and Nwafor (2014) reports **in** their study that, the assistive technology available and functional in Nnamdi Azikiwe Library, University of Nigeria Nsukka are the Braille, audio player/recorder, screen reader, text to audio converter, audio book, and Jaw screen reader

Empirical study carried out by Ezeani, Ukwoma, Gana, Igwe, and Agunwamba (2017) shows that, there is inadequate availability of assistive technology in university libraries in Nigeria as most assistive technology is not available in the University libraries studied. Also, Alabi &. Okiki (2022) also found out that, there is inadequate availability of assistive technology in the academic libraries studied in Nigeria. Similarly, Odigie and Okube (2021) reveals that there is inadequate availability of assistive technology in Academic Libraries of Kogi State and this gross unavailability led to underutilisation of such assistive technology. Additionally, Obim and Akpokurerie (2022) reveals that, there is inadequate availability of assistive Technologies, which translates to low extent of utilisation of assistive technology in the libraries.

The use of assistive technology devices for individuals with visual impairment has numerous benefits. The most prominent benefit is the improvement in the quality of life. Assistive devices enable visually impaired individuals to access digital content, which can improve reading skills, engage in employment, and participate in social activities. Previous scholars have provided evidence on some of the benefits of utilising Assistive Technology. The use of assistive technology improves the chances of enjoyment of human rights (Borg, Larsson, Östergren, Rahman, Bari, & Khan, 2012). Students with special needs can benefit from using assistive technology

to increase and improve their independence in academic activities, and the completion of some challenging educational tasks (Alnahdi, 2014). A study by Clouder, Cawston, Wimpenny, Mehanna, Hdouch, Raissouni, & Selmaoui (2019) in North African countries founds that assistive technology encouraged increase independence by allowing students to execute activities that they were previously unable to.

For most people, technology makes things easier; for people with disabilities, technology makes things possible (Radabaugh, 2014)**.** Assistive Technologies can be applied as adaptive technologies for visual impairments through the use of screen readers, Braille and Braille embossers, desktop video magnifiers, screen magnification software, large-print and tactile keyboards, navigation assistance, and so on (Barrue, 2012). Without assistive technology and accessible environments, children with disabilities may be unable to go from home to school, see what is written on the blackboard, hear and understand the teacher, read the textbooks, use sanitation facilities, participate in sports and recreation, and interact with classmates (WHO & UNICEF, 2015).

Research Methodology
The study adopts Descriptive survey design. Descriptive survey research design aims at collecting data on and describing it in a systematic manner, the characteristics, features or facts about a given population (Nworgu, 2015). The descriptive survey was considered suitable because this study seeks to collect, describe and summarise empirical data on the deployment of Assistive Technology in University Libraries for achieving inclusive and quality education for students with visual impairment in Enugu State. The population of the study is 228 which comprises of the entire 145 library staff of Nnamdi Azikiwe Library,

University of Nigeria, Nsukka and 83 library staff of Enugu State University of Science and Technology Library. Total enumeration technique were used, thus, there were no sampling as the entire population were studied.

The study employed observation checklist and structured questionnaire to collect data from the respondents. The observation checklist were used to collect data on the assistive technology available in university libraries in Enugu State. The structured questionnaire titled: Deployment of Assistive Technology in University Libraries for achieving Inclusive and Quality Education for Students with Visual Impairment Questionnaire (DATULIQESVIQ). The questionnaire were divided into two clusters. The first cluster focus on the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual

impairment in Enugu State. The second cluster focus on the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State. Frequency, Mean and Standard deviation were used to analyse data collected. The frequency count were used to present the data on the available assistive technology, while the real limit of numbers were used for taking decision of each item on research question two and three.

RESULTS
The data collected through questionnaire were analysed and presented according to the research questions guiding the study.

Research Question 1: What are the assistive technology available in university libraries in Enugu State?

Table 1: Observation Checklist of the assistive technology available in university libraries in Enugu State

S/N	Assistive Technologies	NAL, UNN		ESUT, LIBRARY	
		Available	Not Available	Available	Not Available
1	Braille technology	√			X
2	Ray electronic mobility aid		X		X
3	Cane	√			X
4	JAWS Screen Reader	√			X
5	Kurzweil Education		X		X
6	Magnifying glass		X		X
7	Modified Keyboard	√			X
8	Notetaker		X		X
9	Overhead lighting		X		X
10	Raised dots	√			X
11	Screen Reader	√			X
12	Underline/line tracker		X		X
13	Virtual assistant (voice assistant)	√			X
14	eXternal display		X		X
15	Reading assistance software	√			X
16	Speech-to-text software	√			X
17	Smart glasses		X		X

18	Large print books		X		X
19	Typoscope		X		X
20	Low vision Lamps		X		X
21	Laptop	√		√	
	Total	10	11	1	20

Data from table 1 above shows that the assistive technology available in Nnamdi Azikiwe Library, UNN are Braille technology, Cane, JAWS Screen Reader, modified keyboard, raised dots, screen reader, virtual assistant (voice assistant), reading assistance software, speech-to-text software, and laptop, while only laptop is available in Enugu State University of Science and Technology, Library.

Research Question 2: What is the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State?

Table 2: Mean Response on the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State.

S/N	Items	NAL, UNN		ESUT, LIBRARY		Overall			
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	D	R
1	Braille technology	3.12	0.80	1.00	0.00	2.06	0.40	LE	1st
2	Laptop	1.97	1.02	1.55	0.50	1.76	0.76	LE	2nd
3	Magnifying glass	1.96	1.00	1.41	0.49	1.69	0.75	LE	3rd
4	Ray electronic mobility aid	1.97	1.03	1.36	0.48	1.67	0.76	LE	4th
5	Screen Reader	1.36	0.48	1.97	1.02	1.67	0.75	LE	5th
6	Cane	1.97	1.05	1.05	0.23	1.51	0.64	LE	6th
7	Speech-to-text software	1.91	0.02	1.00	0.00	1.46	0.01	VLE	7th
8	JAWS Screen Reader	1.60	0.98	1.25	0.63	1.43	0.81	VLE	8th
9	Smart glasses	1.39	0.49	1.36	0.48	1.38	0.49	VLE	9th
10	Virtual assistant (voice assistant)	1.73	0.45	1.00	0.00	1.37	0.23	VLE	10th
11	Typoscope	1.36	0.48	1.36	0.48	1.36	0.48	VLE	11th
12	eXternal display	1.66	0.48	1.00	0.00	1.33	0.24	VLE	12th
13	Reading assistance software	1.55	0.50	1.00	0.00	1.28	0.25	VLE	13th
14	Kurzweil Education	1.41	0.49	1.00	0.00	1.21	0.25	VLE	14th
15	Large print books	1.36	0.48	1.05	0.23	1.21	0.36	VLE	14th
16	Modified Keyboard	1.36	0.48	1.00	0.00	1.18	0.24	VLE	16th
17	Notetaker	1.36	0.48	1.00	0.00	1.18	0.24	VLE	16th
18	Low vision Lamps	1.05	0.23	1.05	0.23	1.05	0.23	VLE	18th
19	Raised dots	1.08	0.27	1.00	0.00	1.04	0.14	VLE	19th
20	Overhead lighting	1.05	0.23	1.00	0.00	1.03	0.12	VLE	20th
21	Underline/line tracker	1.05	0.23	1.00	0.00	1.03	0.12	VLE	20th

Data from table 2 above shows very low deployment by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State University of Science and Technology, Library. On the other hand, Braille

technology is deployed to a high extent by Librarians in Nnamdi Azikiwe Library, UNN. The mean score also shows that librarians in Nnamdi Azikiwe Library, UNN deploys assistive technology for serving students with visual impairment than their counterpart from Enugu State University of Science and Technology, Library.

Research Question 3: What is the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State?

Table 3: Mean Response on the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State

S/N	Items	NAL, UNN		ESUT, LIBRARY		Overall			
		$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	D	R
1	It will facilitate easy reading among students with visual impairment	3.38	0.72	3.81	0.50	3.60	0.61	VHE	1st
2	Increase and improve their independence in academic activities	3.20	0.77	3.68	0.57	3.44	0.67	HE	2nd
3	Assistive technology encouraged increased independence by allowing students to execute activities that they were previously unable to	3.12	0.89	3.64	0.62	3.38	0.76	HE	3rd
4	Without assistive technology and accessible environments, children with disabilities may be unable to go from home to school	3.15	0.69	3.58	0.75	3.37	0.72	HE	4th
5	Enables students with partial visual impairment to see what is written on the blackboard	3.18	0.96	3.54	0.70	3.36	0.83	HE	5th
6	Improve the utilization of information resources for their academic activities	3.06	0.93	3.62	0.63	3.34	0.78	HE	6th
7	Improves the academic self-concept of students with visual impairment	3.20	0.96	3.22	0.85	3.21	0.91	HE	7th

Results from table 3 shows that the extent to which the deployment of assistive technology by Librarians can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State is high. It will facilitate easy reading among students with visual impairment, with 3.60 mean score ranked first, followed by Increase and improve their independence in academic activities, with 3.44 mean score; Assistive technology encourages and increases

independence by allowing students to execute activities that they were previously unable to, with 3.38 mean score. However, the least is, Improves the academic self-concept of students with visual impairment, with 3.21 mean score. This implies that all the items were accepted to a high extent by the respondents.

Discussion of the Findings

The findings reveals that there are gross inadequate availability of assistive technology in Enugu State University of Science and Technology, Library as only Laptop is the available assistive technology. This finding corresponds with that of Ezeani, et al. (2017) who reports that, there is inadequate availability of assistive technology in university libraries in Nigeria as most assistive technology is not available in the University libraries studied. On the contrary, the findings reveals that, the assistive technology available in Nnamdi Azikiwe Library, UNN are Braille technology, Cane, JAWS Screen Reader, modified keyboard, raised dots, screen reader, virtual assistant (voice assistant), reading assistance software, speech-to-text software, and laptop. This implies that NAL, UNN, has more assistive technology than ESUT, library. This is in accordance with Omekwu and Nwafor (2014) whose earlier study reports in their study that, the assistive technology available and functional in Nnamdi Azikiwe Library, University of Nigeria Nsukka are the Braille, audio player/recorder, screen reader, text to audio converter, audio book, and Jaw screen reader.

The findings reveals low extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State, most especially in ESUT, library where these technologies are not available. However, in NAL, UNN only Braille technology is highly deployed,

while others are less deployed. This finding is in accordance with that of Obim and Akpokurerie (2022) whose earlier study reports low level of utilisation of assistive technology in libraries. The study also corresponds with that of Odigie and Okube (2021) who founds out that there is underutilisation of assistive technology in academic libraries in Kogi State.

The findings reveals that the Librarians agreed to a high extent that the deployment of assistive technology can facilitate the achievement of inclusive and quality education for students with visual impairment in Enugu State. This is because they perceives that it will facilitate easy reading among students with visual impairment, Increase and improve their independence in academic activities, and Assistive technology encourages and increases independence by allowing students to execute activities that they were previously unable to. This implies that assistive technology has many benefits to visual impaired students and can facilitate quality and inclusive education. The findings is in accordance with that of Clouder, et al., (2019) who founds that assistive technology encourages and increases independence by allowing students to execute activities that they were previously unable to. Similarly, the findings of this study further validate that of WHO & UNICEF (2015) who states that, without assistive technology and accessible environments, children with disabilities may be unable to go from home to school, see what is written on the blackboard, hear and understand the teacher, read the textbooks, use sanitation facilities, participate in sports and recreation, and interact with classmates.

Conclusion

The study examines the deployment of Assistive Technology in University Libraries for achieving inclusive and quality education for students with visual

impairment in Enugu State. Based on the findings, the study concludes that, there is inadequate assistive technology in ESUT, library, while it is moderately available in NAL, UNN. However, the extent of deployment of assistive technology by Librarians for achieving inclusive and quality education for students with visual impairment in Enugu State is very low, most especially in ESUT, library where these technologies are not available, however, in NAL, UNN only Braille technology is highly deployed, while others are less deployed. It also concludes that the deployment of assistive technology has very high potentials of facilitating inclusive and quality education for students with visual impairment in Enugu State.

Recommendations

The following recommendations were suggested:

1. The university libraries should source for funds from the parent institution and NGOs to acquire assistive technology to meet the information needs of students with visual impairment.

2. The university library management should formulate and implement policy mandating librarians to deploy and utilise assistive technology to support students with visual impairment.

3. Training programmes should be organised for the librarians so as to equip them with the skills of deploying and managing assistive technology.

4. Regular need assessment of visual impaired students should be carried out by the university library management so as to understand their needs and how to serve them effectively so as to achieve quality and inclusive education.

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