ACADEMIC LIBRARIES IN THE PROVISION OF ASSISTIVE TECHNOLOGIES TO USERS WITH VISUAL IMPAIRMENT. A CASE STUDY OF FEDERAL COLLEGE OF EDUCATION (SPECIAL), OYO IN AFFILIATION TO THE UNIVERSITY OF IBADAN

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Abstract
Assistive technologies are tools used to promote access to information and general education curriculum for students with visual impairment. For those with visual impairment access to a diversity of high and low-tech assistive technologies, including screen readers, magnifiers, electronic braillers, braille in print, assist students in accessing materials in a standard print format that are not available to them. This study focused on the provision of assistive technologies in academic libraries to students with visual impairment to ensure prompt access to relevant and timely information for academic work. Access to information has become increasingly important as society has become information-driven. Descriptive research design was adopted for the study. Sampling technique was adopted in selecting students with visual impairments from 100-400 levels offering different programmes. Simple stratified random sampling technique was used in selecting 25 visually impaired students 15 male and 10 female. The outcome of the study revealed that students with visual impairment find it difficult to make use of relevant information for academic work, due to the unavailability of assistive technologies in the library. Recommendations were made to enable students with visual impairment to have access to relevant and timely information for their academic work.

Keywords: Assistive Technologies, Academic Libraries, Visual Impairment

Introduction

Increasing awareness and accessibility of assistive technology devices and services to students with disabilities is imperative so that students with disabilities can be equipped with the proper technology to assist them with a variety of skill sets. Assistive technology devices and services are best defined by the Assistive Technology Act of 1998, as amended (2004): “Any item piece of equipment or product system whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain, or improve the functional capacities of individuals with disabilities”. Assistive technology serves the purpose of helping and teaching and is measured based on functionality. Additionally, it can be used as a part of a person’s daily life (Cook & Polgar, 2013). Assistive technology devices are used as a means of helping students with disabilities achieve greater independence (Dawe, 2006).

Academic libraries have a responsibility of making libraries collections and services completely accessible to their clientele irrespective of race, colour or disability. Academic Libraries adhering to this principle must satisfy Ranganathan’s Five Laws of Libraries which states:

i. First law: Books are for use (Maximize the use of books)

ii. Second law: Every reader his book (Reader is the prime factor and his/her need must be satisfied).
iii. Third law: Every book has a reader (Find a reader for every book).
iv. Fourth law: Save the time of the reader (Organize information in such a way that the reader finds the wanted information promptly).
v. Fifth law: A library is a growing organism (Emphasis is on comprehensive and evolutionary growth) (Ranganathan,1988).

Access to timely and relevant information has become a prerequisite for survival as information has become a resource for nations, organizations, and individuals. Based on the above, Hawthorne, et al (1997); Calvert and Hernon (2006); Jaeger et al. (2011); Mates (2004) predict that libraries and other stakeholders have become increasingly aware of the importance of providing library access to all users inclusively; this consideration will continue to grow in importance in the future.

The provision of library services inclusively requires the acquisition of relevant equipment and facilities access to information by persons with visual impairment. According to UNESCO (1998), 10% of the world's population is visually impaired. This population may look small and insignificant nationally, but there is an urgent need to provide the necessary equipment and facilities to ensure their timely access to information for learning and research. Technology has evolved to make access to information easy and fast, it is this same technology that libraries can rely on to provide the needed assistance to visually impaired students in tertiary institutions.

Assistive Technology abounds in this technology era, depending on the type and degree of visual impairment, the appropriate assistive technologies can be acquired to suit the needs of the students the library is serving. Assistive technology is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities.

Hopkins (2006), quoted from the Individuals with disabilities education (IDEA) Act of 2004 defines Assistive Technology as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of a child with a disability''. Assistive technology as hardware, software, and web-based resources like touch-screen technologies, large-screen monitors, optical scanners, lightboxes, specialized keyboards, headsets with microphones, screen readers, speech-to-text converters, and browser add-ons with easy access to magnification or talking dictionaries. (Burgstahler 2012; Cummings 2011; Ennis-Cole & Smith 2011; Farmer 2009; Hopkins 2006; Krueger & Stefanich 2011; Neal & Ehlert 2006; Socol 2010).

Assistive Technology involves a device or computer-based accommodation that helps an individual with special needs to work around or compensate for a disability and enhance individual ability, (Goddard, 2004). Video magnifiers, electronic readers, optical character recognition software, magnification software, speech output systems, and electronic Braille devices all provide a solution for a particular individual with a disability and these computer-related aids and equipment are commonly known as an assistive enabling technology. Assistive Technology provides various means for a blind or partially sighted person to overcome several barriers such as the need to read print, use a computer workstation, take notes, and communicate on paper and in electronic settings (Brophy & Craven,2007).

Assistive Technologies in Libraries

Assistive technologies play an important role in equalizing opportunities for people with disabilities in several aspects of life as this technology enables them to overcome various limitations and obstacles faced in all types of environments (Koulikourdi, 2008). Accessible technologies can have a remarkable effect on empowering persons with special needs accompanied by the internet which provides a great opportunity for connections to a range of

people regardless of their location (Baker, et al 2009). Access to information is a major problem for the disabled but today ICT along with assistive technologies have helped to reduce the digital divide between the sighted and the visually impaired by providing information on their desktop or computer (Koganuramath & Chowkimath, 2009).

There are numerous technologies available today for individuals with disabilities to help them to access the printed or electronic materials that are in libraries. So, there is a requirement for highly knowledgeable information technologists and computing staff for handling this technology and creating innovative ways to apply it. Staff providing disability services should be well aware of the needs of the students and find solutions to keep pace with emerging technologies (Berkeley et al, 2007). In an educational context, accessibility to courseware is an issue for disabled learners. This can be provided to them via an interface that is compatible with the various enabling (hardware/software) technologies which need to run in conjunction with the courseware program. The functionality of the interface includes navigation, searching, indexing, bookmarking, and note-taking (Vincent, 1997).

In a library, Assistive technology may be as simple as a magnifying glass, or it can also be sophisticated as a computer workstation with software that can facilitate users with disabilities to scan a book and hear it read aloud followed by highlighted text on a monitor screen. Similarly, libraries can add workstations configured according to the needs of the specific user groups like the provision of speech recognition software for the visually impaired to control the computer or enter the text via their voices, the touch screen monitor, and an electronic tracking device for those who cannot make use of standard keyboards. The libraries can create effective assistive technology programs to find better solutions for providing the access to library resources and services (Goddard, 2004). The accessible workstation allows patrons to adjust the height of the workable and includes a movable arm for mounting the monitor so that the user can tilt the display as required. An ergonomic keyboard tray and a large monitor can also be part of the workstation which allows patrons using screen-enlarging software to see more of the displayed text while moving through the documents (Mates, 2010). Well-planned technological solutions and access points based on the concepts of universal design are essential for the effective use of information and other library services by all people (American Library Association, 2001).

Information can be provided to people with disabilities if the libraries can make necessary arrangements to provide their computing environments to the users for maximum utilization of electronically published materials, regardless of their abilities. There are software options for the libraries which can be adapted to provide services to visually impaired users which includes ‘JAWS (Job Access With Speech) for Windows’ from Freedom Scientific, ‘Window-Eyes’ screen-reading program with a portable application, ‘ZoomText’ magnifier/reader and ‘ZoomText’ keyboard, ‘Dragon Naturally Speaking’ which is a speech-to-text engine that allows users to dictate into Windows-compatible programs, such as Microsoft Word and Outlook and ‘Text Aloud’ which is a Text-to-Speech (TTS) software (McHale, 2007). Other important software programs available for library patrons with blindness or visual impairments include ‘Duxbury Braille Translator (DBT) which is a very popular Braille translator program for Microsoft Windows; ‘CakeTalking’, a computer music and sound creation program that is compatible with SONAR: ‘DocReader’ which is a talking word processor; ‘Reading Bar’ a text-to-speech toolbar for Internet Explorer and it is multi-lingual with a capacity of translating Web pages; ‘Connect Outloud’, a program that allows users with visual impairments to access the Internet, surf the Web, send and receive e-mail and create documents using the Freedom Scientific word processor; Kurzweil 1000 is another text reading software that can read both electronic and printed text that has been scanned into a computer. Also, for text to be modified, saved, signed, or printed by the user, software to use includes a calendar application, dictionary, thesaurus, and spell checker (Sunrich & Green, 2006).

The assistive technology services in libraries provide new opportunities for students with visual impairment to function more productively in various circumstances as it improves access

to information and provides solutions to meet their needs. Therefore, librarians should make necessary considerations before adopting these technologies into their system by examining the available research literature in the area and gaining knowledge through the experiences of other libraries. The librarians have the power to bridge the gaps between people with disabilities and the technologies, now that special hardware and software materials are available to accommodate almost all types of disabilities to help the disabled to realize their potential and to make use of all facilities in the library.

Statement of Problem

This research work is meant to examine the provision of assistive technologies to users with visual impairment. Also, to bring out the significance of the use of assistive technologies in training students with visual impairment. Many visually impaired students cannot access modern assistive technologies because it requires special interface accommodation. The challenge is to effectively harness these technologies in a way that will serve the interest of visual impairment students and the larger teaching and learning community.

Objectives of the study

The specific objectives are to

1. Establish the provision of assistive technologies in the library.
2. Assess the accessibility of these assistive technologies by visually impaired students within the college.
3. Ascertain the provision and extent of use of these assistive technologies in the library by visually impaired students.
4. Establish factors challenging the effective provision and utilization of assistive technologies in the library.

Research Questions

RQ1. What are the assistive technologies needs of students with visual impairment?
RQ2. How often do you have access to assistive technologies in the library?
RQ3. To what extent do students with visual impairment use these assistive technologies for learning and research?
RQ4. What are the challenges students with visual impairment face in the use of these assistive technologies in the library?

Significance of the study

Undertaking this study will expose challenges students with visual impairment face in using these assistive technologies to access information thereby helping the Librarians, and other stakeholders involved in the provision and use of assistive technologies for students with visual impairment with the prerequisite tools in addressing the shortfalls in the system.

The overall outcome of the study will enable the achievement of improved provision and use of assistive technologies by students with visual impairment.

This work will also be useful to researchers and students who will want to carry out further research in this area of study.

Literature Review

Hersh and Johnson (2014) stipulated that access to information is becoming increasingly important and the term information society is often used, with particular stress on the electronically transmitted information. Provision and access to relevant and timely information is important to every tertiary institution student, but to the visually impaired student, it is essential and can be compared to the very air that they breathe. This necessity is indispensable because students with visual impairment are required to produce the same depth of knowledge in a particular subject;

same as their sighted counterparts who have access to a wide range of printed materials/ resources to read.

However, the demands of academic work coupled with the academic environment require access to information for effective and efficient academic work, project work, and research, every student's priority. It has been established that most information is in a print format which makes it difficult for a person with visual impairment to access it. This situation denies visually impaired students in tertiary institutions access to gather important information in the print media. This position has been echoed by the Association of Research Libraries (2012) report on services to patrons with print disabilities established that "the universe of publishing consisted of printed books, magazines, and journals, and only a small percentage of that annual output was made accessible first in Braille and later in talking books."

Mates (2004) reiterated that "the ideal library service is one where each individual, regardless of the degree of visual impairment, have access to materials and information at the time they are required, in the format that can be used, in quantities that are needed, and where the needs of the user are understood by the staff." Todaro (2005), also recognized that access to information is one of the most important human rights as it allows the individual to develop himself/herself, and participate actively in a democratic society, fully exercising his/her rights and duties. Despite the increasing proliferation of assistive technologies, print materials continue to dominate as the most appropriate means of conveying information to the detriment of a person with visual impairment.

Based on the above discrepancies in accessing information by visually impaired students as against their sighted counterparts; technology seems to bridge the gap. Technology has over the years evolved to affect the operations and services of libraries all over the world.

Subramaniam, Oxley, and Kodama (2013), assert that the basic technology resources and assistive technologies for any research library for students with visual impairments include the following:

i. Computers Laptops iPods/iTouch/MP3 players iPads/tablets
ii. Kindles/ E-readers
iii. Large-screen monitors
iv. Braille keyboard
v. Scanners
vi. LCD projector
vii. JAWS software
viii. Text-to-speech software TTY
ix. Smart screen- for partially sighted
x. Dictation software
xi. Talking browser
xii. Optical scanners
xiii. Interactive whiteboard

Furthermore, Borg, Larsson, and Ostergren (2011), identify the importance of assistive technologies to students with visual impairment:

i. The use of assistive technology can increase the participation of visually impaired students academically and socially, but in many countries, these technologies are not available.
ii. The explicit assistive technology measures in the Convention on the Rights of Persons with Disabilities (CRPD) do not cover all human rights or all people with disabilities. This makes it difficult to use the measures for advocacy and policy straightaway.
iii. Based on the principle of non-discrimination it is concluded that all people with disabilities have a right to demand available and affordable assistive technology to ensure their enjoyment of all human rights. The provision of assistive technology is a national as well as an international responsibility.

Methodology

The descriptive research design was adopted for the study. A multi-stage sampling technique was also espoused in selecting the sample size. First, the purposive sampling technique was adopted in selecting visually impaired students from levels 100 to 400 offering different courses. Students with low vision that can read modified printed were not selected as the study did not cover that area.

Second, the simple stratified random sampling technique was employed in selecting five (5) 100-level visually impaired students, ten (10) 200-level students, five (5) 300-level students, and five (5) 400-level students. The sample size for the study, therefore, is 25. The instruments for data collection were a structured questionnaire and an oral interview. The researcher employed research assistants to read the questions to them, and as they respond the assistants begin to tick. The oral interview was used to complement the questionnaire as the researcher observed that the students do not have the means and time to answer the questionnaire. The researcher and the research assistants personally administered the instruments on campus at different times. The oral interview was guided by the interview schedule constructed based on the research questions. The interview outcome was recorded by noting the respondent's responses on a paper. Before the interview, the respondents were told the purpose of the study and made to understand that the outcome will create room for providing the necessary assistive technologies that will facilitate access to information and other resources for effective and efficient academic work. Respondents were equally made to realize the need for them to be sincere in their responses. The administration of the structured questionnaire and interview lasted some weeks. Data collected were analyzed using simple percentages and frequency counts and presented in tables and figures.

Result and discussion of findings

Table 1 Demographic characteristics of respondents.

Characteristics	Frequency (%)
Sex	
Male	15 (60)
Female	10 (40)
Age	
0-20yrs	Nil
21-30yrs	18 (72)
31-40yrs	7 (28)
Above 40yrs	Nil
Type of Degree	
Diploma	0 (0)
Degree	25 (100)

Data from Table 1 above revealed that 60% of the respondents were males while the remaining 40% were females. The male domination found in this study could be a result of the fact that visually impaired students do not get the requisite encouragement from society coupled with a lack of facilities and equipment.

This finding corresponds with the result of the study carried out by World Declaration on Higher Education (UNESCO,1998) elaborates on the alarmingly low percentage of students with disabilities in universities, independent of the country's level of development (Gabel & Danforth, 2008).

Assistive Technologies

To establish the provision and access to assistive technologies, respondents were provided with a list of assistive technologies for visually impaired students in tertiary institutions. Their responses are tabulated below.

Table 2: Availability of Assistive Technologies for V.I students in Federal College of Education (Special), Oyo Library.

Information needs	**Availability**	
	No of respondents	**(%)**
Computers/ Laptops	25	100
Smart view	20	80
LCD Projector	25	100
JAWS Software	15	60
Talking book	25	100
Window Narrator	Nil	Nil
Open book	10	40
Interactive Whiteboard	Nil	Nil

Table 2 above indicates that some assistive technologies are available in the college library for the use of visually impaired students.

Table 3: Usage of assistive technologies in Federal College of Education (Special), Oyo Library.

Information needs	**Usage**	
	No of Respondents	**(%)**
Computers / Laptop	20	80
Smart View	25	100
LCD Projector	23	92
JAWS Software	15	60
Talking book	25	100
Window Narrator	Nil	Nil
Open book	10	40
Interactive Whiteboard	Nil	Nil

According to Table 3, limited assistive technologies are being accessed and used by the visually impaired, to ascertain the World Health Organization (WHO) that in low and middle-income countries, only 5-15% of people requiring assistive technologies have access to them (WHO 2010). The researcher inquired from students how they were able to cope with their academics with these limited assistive technologies. Interesting responses were adduced as respondents cite friends and voluntary service by concerned students. Access to information for classwork, project, or research work was mainly done through personal efforts and friends' assistance.

Factors militating against the provision and usage of assistive technologies
The responses on the factors militating against the provision and usage of assistive technologies for students with visual impairment in the library are tabulated in table 4 below.

Table 4: Factors militating against the provision and usage of assistive technologies

Factors	No of Respondents	%
Unavailability of information materials in Braille and audio-visual format	20	80
High cost of assistive technologies	25	100
Lack of professional/ technical Personnel	15	60
Epileptic power supply	25	100
Inaccessibility of Internet	20	80

The highest factors militating against the effective utilization of assistive technologies in the Federal College of Education (Special), Oyo library identified by visually impaired students are the high cost of assistive technologies and epileptic power supply among other challenges.

Conclusion

Assistive technologies are found as useful aids for visually impaired students to work at their own pace and for them to be on equal footing with their counterparts. Assistive technologies can also be used to support the provision of information and library services to improve learning and research opportunities for the visually impaired on campus. This will have the **ultimate** goal of increasing life chances and educational opportunities for visually impaired students.

Recommendations

Based on the findings of the study, the following recommendations were made.

i. There should be a reduction in the price of relevant assistive technologies to make it avoidable for visually impaired students.
ii. Libraries must ensure the provision of different support services such as digitalization and recording teaching material, creating training courses, and improving learning environments.
iii. There should be an adequate and stable power supply since most assistive technologies require a power supply to power them.
iv. Libraries should ensure the use of assistive technologies by visually impaired students to improve their academic work.
v. There must be a provision of internet within the school premises for the use of the students, especially for the visually impaired.
vi. Qualified professionals / technicians should be employed to operate and assist the visually impaired in the use of assistive technologies.

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