Impediments to Accessing Virtual Education by Learners with Visual Impairments in Kenyatta University

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Abstract: The study was aimed at exploring the challenges that learners with visual impairment face in accessing virtual education. The specific objectives were: To find out the population of learners with visual impairment participating in virtual education, to find out the successes in using assistive technology in virtual education, to identify the challenges that learners with visual impairments face in virtual education venture, and to describe possible solutions towards achieving virtual education by learners with visual impairments. The study was carried out at Kenyatta University, and the population comprised of 80 learners and 5 staff members. Descriptive survey design was adopted. Questionnaires were used to collect data from the learners while personal interviews were conducted for the staff. Descriptive statistics was used to analyze quantitative data while thematic analysis approach was used for qualitative data. Tables and charts were used to present quantitative data while qualitative data was presented in textual mode. The study established that: e-learning had least enrollment of students with Visual impairment, most of the students were not able to retrieve and use e-resources though their own efforts, e-learning platforms were not accessible to learners with visual impairments, more than half of the students found it difficult to use e-resources. The study concluded that: Learners with visual impairments lacked independence in using e-platforms; assistive technology is vital in accessing e-resources. The study recommended: University management to encourage independence of learners through provision of accessible e-learning platforms, information literacy and AT skills, and provision of adequate AT devices.

Key words: impediments, virtual education, e-learning, visual impairment.

1. Introduction

Virtual education has provided learners with a very flexible mode of study and many institutions of higher learning nationally and internationally are adopting this mode of study. While this move has provided learners with a more creative, interactive and flexible experience, there are dangers that some learners will be excluded because they cannot use standard methods of study.

Persons with visual impairment have the same need to have access to all kinds of information as everyone else and for the same good reasons — leisure, education, employment, etc. (Javier & Calvo, 2014). From a

global perspective, the UN Convention on the rights of persons with disabilities, article 21 asserts that "State Parties shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others and through all forms of communication of their choice ..." (Javier & Calvo, 2014).

It is with this background that this study was carried out to find out the challenges of accessing virtual education by learners with visual impairment with the aim of providing suggestions for better access.

2. Gap Identified

Whereas virtual learning offers remote learning opportunities, observation shows that there is low adoption of this mode of study by learners with visual impairment in Kenyatta University. In addition, those in this mode of study spend a lot of time on the computer trying to access information from the virtual learning website. If this situation prevails, learners with visual impairment will continue ragging behind in the current changing times where virtual education is providing several opportunities like studying remotely. They will not be able to access electronic resources which would be a rich bank of worldwide information in all fields of study and more so in the electronic mode of study. The task of this study was therefore to identify the challenges that learners with visual impairment faced in accessing virtual education. The ability to show the challenges would help the university management to consider ways of increasing accessibility of virtual education to learners with visual impairment.

3. Objectives

(1) To find out the enrollment rate of learners with visual impairment in virtual school.
(2) To establish the level of success in using assistive technology in accessing e-resources.
(3) To identify the challenges that learners with visual impairments face in virtual education venture.
(4) To describe possible solutions towards achieving successful virtual education by learners with visual impairments.

4. Research Questions

(1) How big is the percentage of learners with visual impairment in virtual school?
(2) How successful is the use of assistive technology in accessing e-resources.
(3) What are the challenges that learners face in the virtual education venture
(4) Which efforts are made towards achieving virtual education by learners with visual impairments

5. Theoretical Framework

The study adopted the Experiential Learning theory proposed by Carl Rogers (1983). The theory distinguished two types of learning: cognitive (meaningless) and experiential (significant).

According to Rogers, learning is facilitated when: (1) the student participates completely in the learning process and has control over its nature and direction, (2) it is primarily based upon direct confrontation with practical, social, personal or research problems, and (3) self-evaluation is the principal method of assessing progress or success.

In his theory, Rogers emphasized the following:

(1) Significant learning takes place when the subject matter is relevant to the personal interests of the student

(2) Learning which is threatening to the self (e.g., new attitudes or perspectives) are more easily assimilated when external threats are at a minimum

(3) Learning proceeds faster when the threat to the self is low

(4) Self-initiated learning is the most lasting and pervasive.

This theory was applicable to this study because virtual education offers a learning opportunity. In order to make virtual education meaningful to the learner, self initiated learning strategies should be employed. The learner should participate fully in the process of learning and have control over the learning process. University management and teachers should only facilitate this process by providing the right facilities to the learners and equipping them with relevant access skills.

Learners with visual impairments also have similar educational needs as their sighted counterparts. They should therefore be able to access all modes of study independently.

The right equipments should be provided to them, adaptive technology as well as information retrieval skills and skills on the use of adaptive technology. By doing this, the external threats to accessing virtual education are minimized.

6. Literature Review

The use of the internet is becoming an essential part of day–to–day living. This has two implications for people who are visually impaired or blind. First, access to the internet using contemporary technology may present barriers, thus excluding them from fully contributing in society. Second, once accessibility barriers have been overcome, the internet offers a quick access to information that was not readily accessible before (e.g., electronic versions of newspapers, job application as well as academic materials). For these reasons, there has been a great deal of research into how people with visual impairments access the internet, what they use the internet for and the barriers that they face (Hewett, Torgerson & Douglas, 2014).

The increasing provision of Web-based information resources has moved from a simple text interface to dynamic and interactive designs. While this move has provided people with a more creative and flexible experience, there are dangers that some people will be excluded because they cannot use standard methods of access. Research has shown that people with disabilities are most at risk of being excluded from access, and in particular people who are blind or visually impaired and who use assistive technologies such as screen readers (Brophy & Craven, 2014). With initiatives such as the Millennium Development Goals and Education for All by the United Nations (United Nations, 2011) learning materials must be available as open education resources to achieve the goals. In his study (Brophy & Craven, 2007) notes that the accessibility of Web-based information can be improved in two principal ways: through the use of access technology and through adopting good practice in interface design.

With the rapid development of information technology and near–universal access to the Internet, people are increasingly doing more of their reading and information gathering on computers rather than in printed books (Chia-chen & Chen, 2014).

An extensive search produced only one study on the information behavior of students with visual impairment. Saumure and Given (2004) as cited in (Dermody, 2011) indicated that information seeking behavior of students with visual impairment required additional time to ensure the material was accessible.

Various studies indicate that students with disabilities experience unique challenges when accessing library resources (Riley, 2002; Byerley & Chambers, 2002; Coonin, 2002). Students who rely on screen readers experience barriers accessing information due to their rich graphical interfaces and complex web designs of proprietary online databases (Horwath, 2002). Bowman (2002), and Byerley and Chambers (2002) tested the accessibility of specific electronic databases with screen reading software and found they were not user-friendly. Horwath (2002) surveyed users who were blind or visually impaired on the usability of four databases and found that the design had the greatest impact on the accessibility of the databases. Byerley and Chambers (2002) examined the accessibility of two databases (OCLC First search and Expanded Academic) by blind students using screen readers. Web content accessibility guidelines were used as a measurement of accessibility. They found again that design elements in both databases compromised the accessibility of the databases (Dermody, 2011).

A study by Byerley, Chambers and Thohira (2007) examined the accessibility of online databases from the database vendors' perspectives. They found that vendors rated their products as mostly accessible. The study determined that although most vendors test their products for accessibility, only a few conducted usability tests with persons with disabilities using adaptive technology. This 2007 study from the vendor's perspective influenced the authors to conduct their own test using students with print disabilities.

Technology is both an enabler and a barrier for students with print disabilities. While screen readers enable students to navigate their on-line environment, they are limited on how they can interpret a busy website. While database and website design is evolving to the benefit of users who have vision, the contradiction is that their enriched features which create greater accessibility to information also creates barriers for students who rely on screen readers (Dermody, 2011). According to Dermody, database vendors are aware of the barriers their databases pose to students who rely on screen readers. The 2007 study by Byerley et al., indicated that only five of the 12 vendors (EBSCO, Elsevier, JSTOR, LexisNexis, ProQuest) surveyed conducted usability testing with people who have visual disabilities. However, Byerley et al. (2007) indicated in their study that vendors are not addressing accessibility in their marketing efforts.

Assistive technologies used by individuals who are blind are costly and accessible materials, such as popular books and textbooks, are slow to be developed (Stephanie, Laurie & Maatta, 2014). In their study, they asserted that without accessibility features, including voice-over or text enlargement, these e-readers are rendered inaccessible for individuals who have low or no vision.

In a study carried out by Dermody (2011) the students were forced to abandon articles because of technological barriers and this limited the amount of resources they could use to write their assignments. Only the intervention of a librarian or peer would have allowed them to continue in locating the full text and reading the article. Their self efficacy as independent learners is challenged every time they encounter an unreadable PDF or take up to eight hours to find four articles.

7. Methodology

Research Design: The study adopted a descriptive survey research design.

Variables: The dependent variable was the access to virtual education. The independent variable was use of adaptive technology. Use of adaptive technology was investigated and its influence on access to e-resources/virtual education established.

Study location: The study was conducted in Kenya at Kenyatta University. Kenyatta University was

purposively selected since it had the largest population of students with visual impairment compared to other public and private university with virtual learning platforms.

Target population: All learners with visual impairment in Kenyatta University and staff members who served or offered information literacy skills to the users with visual impairment. There were 80 learners with visual impairment and 5 staff members serving them.

Sample size: For the purpose of external validity of this study, all the 80 learners with visual impairment who used KU library and all the 5 staff members who served them formed the sample of this study.

Sampling techniques: Purposive sampling technique was used to select all respondents for this study.

Research instruments: A questionnaire with both open and close-ended questions was used to collect data from learners with visual impairment while a structured interview was used for the staff.

Validity: content validity was achieved by ensuring that the research instrument adequately covered the area being studied. This was done through expert judgment technique. Construct validity was achieved by ensuring that all the terms used were operationally defined.

Reliability: To ensure reliability, the questionnaires were pre-tested. It was administered twice with a time span of two weeks to 4 students with VI who were purposively selected from Kenya institute of special education, a location that was not used during the main study and Spearman rank order of correlation coefficient (Rho) was computed to determine the correlation between the results of the two administrations of the questionnaires. The reliability coefficient that was obtained from the pilot study was accepted since it attained a coefficient (0.75) which the researcher considered reasonable based on Orodho (2009).

Data collection technique: For the questionnaires, personal administration with on–the–spot–collection method was used. Using a recorder, the researcher herself conducted the interviews.

Data analysis: Both quantitative and qualitative methods were used to analyze the collected data. For Quantitative methods, descriptive statistics was used while thematic analysis approach was used to analyze qualitative data. After analysis; tables, graphs and charts were used to present quantitative data while qualitative data was presented in textual mode.

8. Findings

8.1 Enrollment Rate

Table 1   Enrollment Rate

Mode of study	Frequency (F)	Percentage (%)
full time	50	69.44
school based	15	20.83
Part time	3	4.16
Virtual learning	2	2.77
Total	72	100

The study found out that most of learners with visual impairment are enrolled for the full time mode of study and others in the school based mode of study. Evening classes and virtual learning registered the least number. The two students registered in the virtual school during the time of the study were low vision while totally blind students were nil.

8.2 Ease in Using E-learning Website

This was based on that fact some of the courses are offered online for students in all modes of study. The students were asked to indicate the ease with which they are able to access and use the e-learning website. They were given a statement that "I am able to find everything I need from the e-learning website" and were required to indicate whether they strongly agreed, agreed, were uncertain, disagreed or strongly disagreed to that statement. The findings were as presented in Table 1.

Table 2   Ease in Using E-learning Website

It is easy	Frequency (F)	Percentage (%)
Strongly agree	3	4.2
Agree	15	20.8
Uncertain	12	16.7
Disagree	34	47.2
Strongly disagree	8	11.1
Total	72	100

As indicated in Table 1, majority of the students which constituted 47.2% disagreed with the statement. It was therefore clear that the library website was not very accessible to users with visual impairment which could be attributed to the design of the website or lack of good orientation in accessing the library website where important information about the library collection can be found.

A study by (Brophy & Craven, 2014) also found out that users with visual impairments face the challenge of web inaccessibility. The information provided on screen must be presented in a way that can be interpreted by any kind of access technology. This is what is referred to as "accessible Web design", "design for all", or "universal design" (Brophy & Craven, 2014). For instance, the advances in Web 2.0 and the new virtual learning environment does not always take into consideration whether or not it is compatible with the assistive technology students rely on (Dermody & Majekodunmi, 2011). This therefore important for web designers to take into consideration all categories of users including those with visual challenges when designing the websites.

8.3 Ease in Using E-resources in Virtual Education

This was based on the fact that students in full time and school based modes of study also access e-resources from the library. In order to establish whether the students with visual impairments found it easy to use e-resources or not, the researcher posed a statement that "it is easy to use e-resources" and the respondents were asked either to indicate the level at which they agreed or disagreed to the statement. Their responses were as presented in Figure 1.

The findings indicated that more than half of the students engaged in the study either disagreed or strongly disagreed to the statement that "it is easy to use e-resources". Specifically 52.8% which constituted more than half of the sampled students indicated that it is not easy to use e-resources. This finding could be attributed to inaccessible web designs, low literacy levels in using electronic resources, lack of knowledge in using assistive technology and lack of motivation in using e-resources possibly caused by the above factors. However a small but significant number of students indicated that it was easy for them to use e-resources. This is a good indicator to the library management that it is possible for the library users who have visual challenges to use electronic resources and that those who are not able to use them can be facilitated and supported once their challenges of access are known.
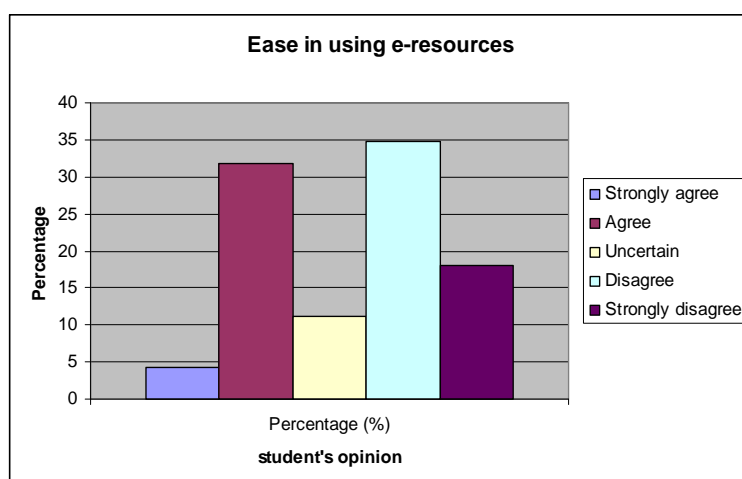
Figure 1   Ease in Using E-resources in Virtual Education

The findings of this study suggest that there are various challenges facing students with visual impairments when accessing e-resources among which could be technological barriers as well as personal barriers. In a study carried out by (Dermody, 2011) the students were forced to abandon articles because of technological barriers and this limited the amount of resources they could use to write their assignments.

8.4 Challenges of Accessing E-resources in Virtual Education

The heart of this study was to establish the challenges that face learners with visual impairment with the aim of providing information to policy makers, information providers for better strategies in dealing with the challenges. The students were asked to list the challenges that they faced when accessing electronic resources. The findings were as presented in Table 3.

Table 3   Challenges of Accessing E-resources

Challenges	Frequency	Percentage
Inadequate computers	22	30.7
Inadequate skilled staff	10	13.8
Lack of AT skills	28	38.9
Lack of training on e-resources	12	16.6
Total	72	100

From the Table 3, the findings reveal that there are various challenges that face learners with visual impairments in accessing e-resources. These are the challenges that are common to many users with visual impairments that use the Post Modern Library. The information extracted from the data above can be possibly used by university librarian and other policy makers in designing strategies of overcoming the challenges that cut across several users even before addressing the more specific challenges as brought out in the findings as per objective 3 and 4.

The staff serving in the section were also asked about the challenges that they experienced while serving students with visual impairments specifically when accessing e-resources. Their responses are as presented below:

- Many students do not have basic computer skills thus forcing the staff to spend much time with a single student retrieving the e-resources for them.

- Inability of a staff to demonstrate the processes that they explain to the users through assistive technology. For example when offering user education on access to e-resources.
- Lack of assistive technology skills that can facilitate better assistance to students when accessing e-resources

Research has shown that people with disabilities are most at risk of being excluded from access, and in particular people who are blind or visually impaired and who use assistive technologies such as screen readers (Brophy & Craven, 2014). The findings of this study shows some agreement with various studies which indicate that students with disabilities experience unique challenges when accessing library resources (Riley, 2002; Byerley & hambers, 2002; Coonin, 2002). Therefore it is true that students with visual impairment face challenges when accessing e-esources. Ability to show the specific challenges faced by the library users who have visual challenges will act as a reference point for library management in ensuring provision of support to this category of users especially when accessing e-resources which could benefit the users once high independence levels of a user is achieved.

8.5 Suggested Solutions

The researcher sought to find out from the library users sampled, their suggestions to dealing with the challenges that they had listed in table 3 above. Their responses were as presented in Table 4 below.

Table 4   Suggested Solutions by Students to the Challenges of Accessing E-resources

Suggested solution	Frequency	Percentage
Increase the number of computers with AT	26	36.1
Training organize training sessions for students with VI on e–resources	15	20.8
Internet connectivity	10	13.9
Conduct staff induction on AT	10	13.9
Increase staff	7	9.7
Upgrading of screen reading programs	4	5.6
Total	72	100

From Table 4, the sampled students offered various suggestions for the challenges that they had earlier indicated in Table 3. From these findings, it is clear that access to e-resources can be improved mainly by ensuring adequate provision of computers fitted with assistive technology, conducting organized and frequent trainings on how to access e-resources, improving internet connectivity and conducting staff induction on adaptive technology. Library management should therefore consider the above suggestions for improvements in access to e-resources by students with visual impairment since they are directly gathered from this specific category of users.

During the interview, the staff serving users with visual impairment in the library were also asked to suggest solutions that they thought would be of help in improving access of e-resources to users with visual impairment. The findings were as indicated below:

- Organizing meetings with students in order to understand better their information needs as well as get an avenue of knowing the specific challenges that they face while trying to access various informational resources with e-resources being part.
- By benchmarking in other advanced institutions on how to go about retrieval of e-resources by specific categories of users.
- Offering training to the students on access to e-resources.

- Provision of enough facilities like computers and assistive technology programs.
- Ensuring staff motivation.

It is therefore clear that there are possibilities of improving access to e-resources. These findings are in agreement with that of Brophy & Craven (2007). They noted that the accessibility of Web-based information can be improved in two principal ways: through the use of access technology and through adopting good practice in interface design.

9. Conclusion and Recommendations

The study concluded that there were impediments to the participation of learners with visual impairment in virtual education. The main challenges were low skill levels in AT for both staff and students, low literacy levels in accessing e-resources and inaccessible websites.

This study recommends advocacy for and facilitation of learners for learners' initiative where learners who are knowledgeable in the use of AT on the e-platform can assist the others during their free time. The study further recommends that the university management organizes training and induction forums for staff on AT and e-resources. This is because both areas are dynamic and important to learners.

References

Brophy, P. and Craven, J. (2014). *Web accessibilityVol. 55 No. 4 pp.950-972, doi: 10.1353/lib.2007.0029*

Byerley S. L. and Chambers M. B. (2002). "Accessibility and usability of web-based library databases for non-visual users", *Library Hi Tech*, Vol. 20, No. 2, pp. 169–178.

Chia-chen C. H. C. and Chen C. (2014). "Exploring switch intention of users ' reading behaviour", doi: 10.1108/EL-06-2012-0070.

Coonin B. (2002). "Establishing accessibility for e-journals: A suggested approach", *Library Hi Tech*, Vol. 20, No. 2, pp. 207–220.

Dermody K. (2011). "Online databases and the research experience for university students with print disabilities", doi: 10.1108/07378831111116976.

Dermody K. and Majekodunmi N. (2011). "Online databases and the research experience for university students with print disabilities", *Library Hi Tech*, Vol. 29, No. 1, pp. 149-160, doi: 10.1108/07378831111116976.

Hewett R., Torgerson C., Douglas G., Hewett R., Torgerson C. and Douglas G. (2014). "Peer-reviewed paper accessibility of apple ipad for partially sighted users: Pilot study", doi: 10.1108/JAT-09-2013-0029.

Javier F. and Calvo M. (2014). "The role of libraries in the implementation of the Marrakesh Treaty for persons with a print disability", pp. 1–9.

Kleynhans S. A. and Fourie I. (2013). "Ensuring accessibility of electronic information resources for visually impaired people: The need to clarify concepts such as visually impaired", doi: 10.1108/LHT-11-2013-0148.

Stephanie L. M., Laurie J. B. and Maatta S. L. (2014). "An evaluation of the functionality and accessibility of e-readers for individuals with print disabilities", doi: 10.1108/EL-01-2013-0012.