Barriers to the Use of Computer Assistive Technology among Students with Visual Impairment in Ghana: The Case of Akropong School for the Blind

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Abstract
The study aimed at exploring barriers to the use of computer assistive technology among students with visual impairment at Akropong School for the Blind. A case study design was adopted and the purposive sampling technique used to select 35 participants for the study. The researchers gathered qualitative data using an in-depth interview guide to investigate barriers to the use of keyboarding skills and Job Access with Speech (JAWS).Data were transcribed and analysed thematically. That is the key themes were identified in the conversations and these were drawn and discussed. This was done using both the narrative methods and opened quotes from interviews. The findings indicated that challenges limiting effective use of computer assistive technology in the School were more personal than external influences. This was because most of the challenges were due to the individual response to the training and familiarity in developing their competencies in using computer assistive technology. Based on this, it was recommended that efforts should be made to stock the laboratory with additional computers. Directly in line with the first recommendation, it was further suggested that more practice time should be created for the students to maximize computer use. Also, Licensed JAWS must be acquired by the school to advance students' competence in using computer assistive technology. A number of the challenges were expressed by the students on their non- familiarity with the JAWS. As a result, it was recommended that instructors and trainers at the school should engage the students in revised lessons on introduction to computer. This will help to refresh the minds of students.
Keywords: Visual impairments, computer assistive technology, keyboard, Job Access with Speech and Ghana.

Introduction

The use of computer assistive technology has captured the attention of students with visual impairment. Specifically, computer assistive technology has given visually impaired people ever-expanding opportunities for personal and professional growth (Sah, 2013). Obviously, the success in getting information in our society today, demands computer literacy.

Besides the braille, it appears that, no invention has enabled blind and visually impaired people to communicate as effectively assistive technologies that have made computers and the Internet accessible. Assistive technology is involves both assistive technology devices and assistive technology services (Presley & D' Andrea, 2008). In fact, an assistive technology device, whether acquired commercially off the shelf, modified, or customized, which is used to increase, maintain, or improve the potential capabilities of children with disabilities (Kotain & Sharma, 2010). The visually impaired learns about their environment mostly through the sense of touch and hearing unlike other disability groups (Smith, 2008). Without the skills in the use of computer assistive technology, these students may find it difficult to access the computer and explore maximally, the world they live in. As computer users with visual impairment, the ability to use the computer keyboard to both get around and issue commands is critical. Particularly, if they use a screen reader, they would rely on keyboard commands instead of a mouse in order to get their computer work done. The ability to utilise information technology is important in most other aspects of life, such as, email for correspondence, home-banking and access to public libraries. As such, information technology, computer literacy and information access are important to every-one in society, the visually impaired not excluded. To make such a highly visual environment accessible to those unable to see a computer monitor, assistive technology enables users to read all onscreen content, whether emails, spreadsheet columns and application tool bars. Assistive technology also provides a means to navigate one's keyboard and desktop, open and use programs, and browse the web.

The technology that makes this navigation possible is the Job Access with Speech and magnification software programs (Gerber & Kirchner 2007). These Screen readers give voice to computers through

applications that synthesize written words and keyboard commands into human-sounding speech for the visually impaired to hear and visualise what is written on the screen. Thus, the use of computer assistive technology has become a part of the core curriculum in junior high schools in Ghana. In Ghana's quest to equip students with the needed competencies in computer usage, many professionals have been trained to help the visually impaired gain adequate knowledge in information technology programs. Among the reasons for this is that most students with visual impairment at one point in time find themselves in environments where the use of computer will be needed to make a living and gain independence. In spite of these benefits, students with visual impairment are likely to encounter some problems in its usage. Some of these problems are that students with visual impairments appear to exhibit errors in keyboarding skills. This appears to be due to student's inability to remember keyboard shortcuts, as well as difficulties in having access to license speech software and inability to discrimination voice of Job Access With Speech (JAWS). Challenges to the use of computer assistive technology do not only pertain to developing countries like Ghana. In fact, a study conducted in the United States suggests that individuals with visual impairment are not fully benefiting from the use of computer assistive technology at home, school and community (Gamble &Hirsch, 2003). Similarly, Kapperman and Sticken (2002) reported that 60% of students with visual impairments were not benefitting from computer assistive technology as a result of the challenges and lack of the needed competencies for using these technologies. Again, it appears that there are also inadequate qualified personnel with regard to teaching computer assistive technology. Furthermore, it seems the difficulties faced by persons with visual impairment in the usage of computer assistive technology in school is due to lack of adequate computers to meet the needs of students who are blind. Besides, it appears that the huge impact of technology has not impacted on teaching and learning of those with visual impairment. Many professionals appear to understand, at least anecdotally, that computer use could make a tremendous difference in the lives of students with visual impairments by improving their educational and employment opportunities, enhancing their social networks and facilitating their independence, yet, little research has been conducted to document the challenges to computer usage among students with visual impairments in Ghana.

Such information or data is important for planning appropriate intervention for the optimum utilization of assistive technology thereby improving the quality of life in Students with visual impairment.

Methods
Participants and data collection:
35 second year students with visual impairment at Akropong School for the Blind, made up of 23 males and 12 females were purposively sampled for the study. The 2nd year students were chosen because they have attained some degree of mastery in computer use. A self-designed in-depth interview guide was used to collect data from participants.

Results
Challenges on keyboarding skills:
About 95% of students indicated their unique challenges in keyboarding. In relation to the first challenge namely, the arrangement of keys on the keyboard, the students explained that they found it difficult to identify some of the keys on time particularly, the alphabetic keys. Specifically, they were un-impressed with the arrangement of these keys on the keyboard which deviates from their conventional knowledge in the flow of alphabetic count. This is typified in the following expression by one student;
"I have difficulty in identifying the letters on the keyboard because the alphabets do not follow the normal arrangement of A, B, C... X, Y, Z"

Directly linked with the arrangement of keys, another challenge was the spacing of keys on the keyboard. Accordingly, the students opined that the location of the keys on the keyboard is so close that this affects their competence in the speed and accuracy of constructing sentences. Whereas it is true that consistent practice and use of the keyboard helps a user to develop familiarity with the spacing between keys, this familiarity has not been fully developed among the respondents. Again, even though the class had computer lessons twice a week, the students perceived the amount of time spent as being limited. In expressing a viewpoint on this, one student states;
"There is inadequate time for practice and this has affected my typing skills. Therefore I could not type fast and accurately"

Consequently, most of the respondents therefore complained that it takes extended practice time for them to develop familiarity with the various keys.

Another challenge that was raised on keyboarding skills was the difficulty in remembering shortcuts. It is well known that computer usage comes with an added benefit of employing shortcuts to navigate a document or carry out other processes. However, most of the students indicated that they found it difficult to remember most of these shortcuts. While it is undeniable that remembrance of these shortcuts does not come handy, our

study found out that the students' inability to remember shortcuts is directly linked with their difficulty with arrangement and spacing of keys on keyboards.

Lastly, some respondents also had difficulty of developing motor skills. This is because, they have deformity on their wrists (fine motor skills) and this may have affected their finger positioning and ability to navigate swiftly across different parts of the keyboard.

Challenges on the Use of Job Access with Speech:
Our study also found that about 95% of the students at the Akropong School for the Blind have challenges in using the JAWS software as computer assistive technology. It was as found that, there is always malfunctioning and sometimes sudden failure of the JAWS application as it is being used and. the students believed this retards progress in their studies. In expressing this frustration, one of the students indicated:
"At times, the JAWS could stop working while being used hence reducing efficiency"
Upon further interaction, they explained that the type of JAWS that is being used in the school is unlicensed and is thus limited in some of its applications or functions. The students are therefore limited to access other uses of JAWS because they use the "cracked version" coupled with it inefficient functioning.
Some of the students had the challenge of adjusting from the use of mouse to the use of shortcuts. This challenge was faced by a number of the students who initially had their sight and were thus, familiar with the use of the mouse. But when they later lost their sight and were brought to the school for the blind they had difficulties adjusting from their knowledge of the use of mouse to memorizing and using shortcut as required by the JAWS application.

Strategies to Address Challenges associated with Computer Assistive Technology Use
Keyboarding Skills:
Respondents in this study outlined a number of strategies that they thought could help address the challenges hindering their competence in keyboarding skills. In the first place, it was found that mental drill as a strategy could be adopted by the ICT teacher to address the challenge of remembering numerous shortcuts. One respondent explained that,
"There is ten (10) minutes mental drill conducted by the ICT teacher on keyboard shortcuts and this has helped us to memorize more shortcuts in order to improve our competence".
Secondly, to address difficulty of students with the arrangement and spacing of keys on the keyboard the way forward has been in developing their familiarity. In this regard, one student indicated that:
"The teacher has been encouraging them to have additional computer classes during vacations. He emphasized that when they are able to do that then they can practice more to help themselves develop familiarity with location of the keys on the keyboard"
Directly linked with the above, another student pointed out that,
"During computer lessons each of us is given the opportunity to show the positioning of various parts of keyboard. And this has helped us to develop familiarity with the positioning of the keys, especially the arrangement of the alphabetic keys"

JAWS Application Use:
To address the challenge of voice recognition, the students indicated that, their teacher always encourages them to listen carefully to the speech of the JAWS in order to become familiar with the voice. A student said that,
"We are often given ten (10) minutes to listen to the speech and explain our understanding to the teacher and this has helped us to understand the accent"
Other respondents also expressed that, the teacher has been helping them with some of the pronunciations to have a better understanding of voice recognition in the JAWS application. There is also a mental drill on the JAWS usage and the students stated that in order to get good marks, they have to listen keenly and this has also contributed to enhancing their familiarity with JAWS use.
As it was noted earlier, Akropong School for the Blind has an unlicensed version of JAWs which malfunctions and fails at times. When asked what was being done to address this challenge, one respondent said:
"The Parent-Teacher Association (PTA) and benevolent individuals and philanthropists have been encouraged to help the school obtain licensed JAWS for the computer laboratory"

Discussion:
Challenges associated with computer assistive technology use among students at Akropong School for the Blind
There are numerous benefits of computer assistive technology among students with visual impairment. It is particularly noted that through the use of these devices, students with visual impairment gain independence and autonomy concerning information management and access to communication, just like their peers with normal

vision (Caparos, 1994). That notwithstanding, a number of barriers exist to the successful and effective use of assistive technology devices among people with various disabilities in schools. This is evident in the fact that 95% of the students at Akropong School for the Blind highlighted various challenges which hamper their competencies in keyboarding and JAWS application use.

However, the results of the study show that, the challenges mentioned by the students are related to personal response to computer assistive technology use rather than external influence. These challenges arise due to the individual response to the training and familiarity by the students in developing their competencies in using computer assistive technology. This however excludes the malfunctioning and failure of JAWS application. This challenge has an external influence and its manifestation is linked with limited financial resources, high costs of equipment and eligibility issues for possessing devices (Fifield & Fifield, 2002), as well as a lack of knowledge and support from teachers (Alper & Rahrinna, 2011) the case of the students at Akropong School for the Blind is however different. This is because the various strategies that the students highlighted as being used to address their challenges demonstrate knowledge and support from their ICT teacher.

In another study, Johnson (2011) indicated that a lack of knowledge and awareness among people with visual impairment, reluctance to use the devices, poor device performance, changes in needs or priorities, and feelings of stigmatization are major reasons for underused assistive technology devices. Our study results seem however, to suggest that there are effective strategies that are being adopted by the ICT teacher at Akropong School for the Blind to address their challenges. The students' competence in using computer assistive technology has been affected by the malfunctioning and sometimes failure of JAWS.

Implications and recommendations
The study showed that, the challenges mentioned by the students are related to personal response to computer assistive technology use rather than external influence. In other words, these challenges raised are likely, due to the individual response to the training and familiarity by the students in developing their competencies in using computer assistive technology. Because the ICT laboratory is stocked with desktop computers demanding direct power supply this study recommends that efforts should be made by management of the school and other benevolent individuals and philanthropic organizations to help procure power stabilizers for power management in the case of interrupted power supply. A number of the challenges expressed by the students on their non-familiarity with the JAWS. As a result, we recommend that instructors and trainers at the school should engage the students in revised lessons on introduction to computer. This will help remedy their difficulties in the use of JAWS and Keyboard. We further suggest that additional time should be allocated to ICT lessons on the time table to maximise student's potential in the use of computer assistive technology and also obtaining license Job Access with Speech (JAW).

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