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Adoption of DETB with SRP amongst VIP at Tertiary Institutions in Malaysia

Chow Sak Chin, Grace Annammal Piragasam
Universiti Pendidikan Sultan Idris, Malaysia

Abstract
An exploratory use of adaptive technology particularly Digital Electronic Textbooks (DETB) with Screen Reading Programmes (SRP) amongst visually impaired students at tertiary education institutions in Malaysia. Visual blindness is among the disabilities that can adversely affect the learning of a student enrolled in a tertiary education institution. As such, adaptive technology devices have become essential tools for students with visual impairments. The purpose of this qualitative study is to explore, describe, and interpret the experiences of students with visual impairments in using Digital Electronic Textbooks (DETB) with Screen Reading Programme (SRP) to assist their learning. The study is looking at what factors influence students with visual impairments to adopt or reject DETB with SRP. This is a qualitative study which involves the method of interview and observation. Finding shows that functionalities of certain adaptive technologies may influence the visually impaired students preference in adopting such devices. Meanwhile, all the direct benefits of the adaptive technology of DETB with SRP such as handy, portable, enhance reading understanding as well as support from parents, university administrators and lecturers, are among direct connection to the adoption. The main factors that negatively affected the adoption of DETB with SRP identified are the scarcity of DETB and accessibility conundrums such as graphics and images. Lack of familiarity and knowledge about the execution of DETB with SRP effectively is another influencing factor.
Keywords: Accessibility, Digital Electronic Textbook, Screen Reading Programme, Visually Impaired.

Introduction

Digital electronic textbooks (DETB) are among the main adaptive technology for visually impaired students in technology. The advanced information technology converts traditional printed books into readable and editable text on a compatible computer or electronic device that a visually impaired student could navigate the contents assisted by a screen reading programme (SRP), to enable them to access the content independently (Malcolm& Roll, 2017). DETB could be in many formats, including PDF, Microsoft Word and E-Pub, which allows the learner to access them on

multiple gadgets such as smartphones, computers, and tablets. Therefore DETB refers to digital books that could assist students who have low vision or are blind.

Several screen reading programs (SRP) that exist commercially is JAWS screen reader which literally stands for Job Access With Speech, could assist the blind and visually impaired people in navigating through DETB. Another one is popularly known as Hal screen reader. Additionally, there are some open source SRP applications such as Non Visual Data Assistant (NVDA) and pre-installed Voice Over and Talk Back on mobile phones available for visually impaired individuals. Visually blind learners could use the physical keyboards or flick their fingers on the accessible touch screen-based devices to navigate through a given text or to surf the internet (McAlvage & Rice, 2018).

Individuals who were born blind visually are known as congenital blindness. Congenital blindness refers to a visual disability that "occurred at birth or prior to the time when [the individual] would have had useful visual memories" (Welsh, 2010, p. 176). Meanwhile, an individual who acquires adventitious vision loss suffers not only from blindness, but also a form of disability. Disability as a consequence of vision dysfunction, hence, results when the eyes or the visual cortex processes the images, which includes the optic nerve, retina, or brain has its functions "disrupted or deranged" (Jose & Sachdeva, 2010, p. 138).

DETB With SRP could assist the learning of visually impaired students irrespective of the classification of their visual conditions. Nevertheless, it is essential for the adaptive technology to have features that could address the unique needs of each blind students. Hence, this study is to investigate the factors that influence the adoption of adaptive technology, particularly DETB with SRP amongst visually impaired students at tertiary education to assist learning.

Literature Review

Types of Adaptive Technology

No definitive definition is in existence for adaptive technology. Assistive technology is formally defined by Individuals with Disabilities Education Act (IDEA, 1990) as "any item or equipment piece, or a system of product, regardless of such being commercially acquired off the shelf or not, undergoes modification or customisation, used in increasing, maintaining, or improving functional proficiencies of a child suffering from disability" are all part of assistive technology (20 U.S.C. 140(1)).

DETB can be defined as a traditional print book that comes in an electronic form, and with the capability of being read through the use of a personal computer or through the use of an eBook reader (an eBook is possibly a software application utilised on a computer like a Microsoft's free Reader application, or a computer that comes in the size of a book solely utilised as a reading device) (Razek & Modayan, 2012; Olivero, 2009). It is possible for a user to buy an eBook stored in a diskette or a CD. However, buying an eBook (or any type of reading material) that comes in the form of a downloadable file from a Web site, or through university libraries, to make it

possible to be read from the computer or reading device of the user is the most widely used procedure in obtaining an eBook (Jones, 2009; Danielsen, Taylor, & Majerus, 2011).

It is possible for an individual suffering from total blindness to access and read DETB by utilising a feature where a synthetic voice is used to read the text aloud verbally on screen (Allan, Lowney, Patch, & Spellman, 2015). This phenomenon is known as screen reading programmes (SRP). Tablet computers like the iPad and Android tablets have such accessibility features made available in them (Crossland, Silva & Macedo, 2014; Lockyer, Creaser & Davies, 2004). There is a built-in (free) text-to-speech capability, imbedded in iPads and iPhones, very popular with people suffering from visual impairment, known as VoiceOver (D'Agostino, 2010). Also, for windows-based computers, the popularly known SRP, JAWS, could assist visually blind students to navigate the contents of the DETB as in PDF, Microsoft Word, Arkinston and HTML formats respectively.

DETB with SRP enables visually impaired students to jump to a desired page or certain paragraphs handily as well as to go through lines, sections, and subsections within a book speedily (Allan, et al., 2015). This is most helpful when requiring to rapidly look up information. This is to contrast to the outdated use of obsolete cassette tapes in old days rewinding and fast-forwarding to the desired content within a textbook (Cryer, 2008). As such, SRP is the piece of software application that could assist the visually impaired individuals to navigate and read the content on the screen. Both Screen Reading Programme (SRP) and Digital Electronic Textbooks (DETB) are classified as Adaptive Technology (AT) (Osiceanu & Popa, 2015).

Restrictions to Effective Use of Adaptive Technology

The successful and effective utilisation of assistive technology, particularly DETB with SRP amongstvisually impaired students at tertiary education and homes, as well as in communities is bombarded by some prevailingrestrictions to hurdle through. Abundant factors, such as limited financial resources (Fifield & Fifield, 1997) and expensive equipment (Wehmeyer, 1998), as well as absence of knowledge and lack of support from teachers (Alper & Raharinirina, 2006) and matters of eligibility for possessing such devices (Zhang, 2000) are all directly linked to the restrictions when it comes to successful and effective use of DETB with SRP.

A national survey, in the United States, on adaptive technology abandonment of individuals who acquire different disabilities reveal that nearly 33% of assistive technology devices were not utilised as a result of some compelling circumstances such as: a) absence of thought and enthusiasm in utilising devices coming from the people who have disability needs; (b) selection of technology tools by family members rather than by users; (c) complex designs; (d) defective equipment; (e) inadequate fundings for the assistive technology devices; and (f) absence of technical backing (Johnson, 2011). In one other study, Johnson (2011) concluded that an absence of knowledge and familiarity amongst visually impaired students, lack of enthusiasm in the utilisation of the adaptive technology, dismal device performance, changes in requirements or options, and feelings of being stigmatised, turn out to be the major reasons for inadequate utilisation of adaptive technologies.

Another greatest challenge to visually impaired students nowadays still boiled down to the fact that many required textbooks are not available as in accessible electronic forms. Even if they are available, most often, they are not the latest edition of the books, and also they have to adapt to each student's learning approaches and styles (National Center on Accessible Educational Materials, 2018).

Many DETB are inaccessible due to the fact that most authors are oblivious about the accessibility guidelines for the visually impaired individuals (Lin, Chiou and Huang, 2013). They are not strictly abide by the Web Content Accessibility Guidelines (WCAG) 2.0 accessibility guidelines to make the DETB accessible before publishing them online and distributing them into the market (Maatta & Bonnici, 2014). There are rather limited adaptive technology or other forms of accessible devices that are not entirely compatible with the DETB content. A classic example would be statistical graphs or graphical images are almost impossible for the SRP to read the content in such as comprehensible manner (Holzinger &M iesenberger, 2009). Hence, DETB with SRP would be a perfect match if the DETB are to be processed and designed by following the accessibility features guidelines.

Benefits of Adaptive Technology

Adaptive technology devices are, today, vital tools for students having visual disabilities to utilise. Students are allowed by Assistive technology devices like test-to-speech(TTS) or better known as SRP to: a) gain access to educational resources (Beard, Carpenter, & Johnston, 2011), (b) engage in the maximisation of self-reliance in the performance of tasks (Davert, 2017), (c) engage in discourses (Davis, Barnard-Brak & Arredondo, 2013), (d) gain access to peer groups (Ault, Bausch & McLaren, 2013), and (e) make preparations for higher education and future careers (Wolffe & Kelly, 2013). In recent years, a broad study has been undertaken with regards to the benefits of the use of assistive technology devices in teaching and in learning within an educational setting (Pal, Vallauri, &Tsaran, 2011). The positive effect which assistive technology devices have in the lives of students suffering from visual impairments like motivation of students (Winter, 2013), and the development of positive relationships in academic accomplishment (Zhou, Ajuwon, Smith, Griffin, Parker & Okungu, 2012), have been revealed by different studies. Several studies have been conducted on how useful and effective assistive technology is on students suffering from learning disabilities.

The positive effect of adaptive technology devices on students' learning, precisely when it comes to enhancing understanding as well as increasing the speeds of reading and rates of comprehension have been discovered by scholars (Chandran, Aravind, Gopinath & Saranya, 2015). Visually impaired students will regard adaptive technology, distinctly DETB with SRP are sharable, portable, vital in improving their learning and cognition, as well as their social development (Wong & Cohen, 2011).

Research Purpose

The purpose of the study is to investigate the factors that influence visually impaired students' decision to either adopt or reject the adaptive technology of DETB with SRP at tertiary education institutions in Malaysia.

Research Objectives

The main objectives of this study are to determine:

1. The types of visual loss and the adaptive technologies used amongst visually impaired students of tertiary education institutions in Malaysia.
2. The awareness of Digital Electronic Textbooks (DETB) amongst visual impaired students at tertiary education institutions in Malaysia.
3. The support and accessibility issues of assistive technology influence the use of Screen Reading Programme (SRP) amongst visually impaired students of tertiary education institutions in Malaysia.
4. The benefits and disadvantages of using the DETB with SRP by visually impaired students of tertiary education institutions in Malaysia to assist their studies.

Research Questions

Follows are the research questions addressed in the study:

Research question 1: What are the types of visual loss and the adaptive technologies used amongst visually impaired students of tertiary education institutions in Malaysia?

Research question 2: What is the awareness of Digital Electronic Textbooks (DETB) amongst visual impaired students at tertiary education institutions in Malaysia?

Research question 3: How does the support and accessibility issues of assistive technology influence the use of Screen Reading Programme (SRP) amongst visually impaired students of tertiary education institutions in Malaysia?

Research question 4: What are the benefits and disadvantages of using the DETB with SRP by visually impaired students of tertiary education institutions in Malaysia to assist their studies?

Methodology

Sample

The research population will consist of six students with visual impairments, ages between 18 and 30. These six participants have to be university students. Participants were selected from various colleges or universities in Malaysia, who use Digital Electronic Textbooks (DETB) with screen reading programme (SRP) to assist learning. The participants have to be classified as either suffering from complete visual blindness or low vision, so as to provide their personal experience on the research study, in which the study is all inclusive by means of demographics as diverse backgrounds of visually impaired students from different races, ethnicities and genders are able to participate indiscriminately. All the six visually impaired participants were observed based on the tasks assigned and interviewed based on the research questions.

Instruments

A phenomenological design requires that the researcher should be subjective and they have to see things from the participants' point of view (Willig, 2008). Consequently, an in-depth interview will be used as it provides detailed information which is useful for proper understanding of the issues addressed, hence, the researcher would be able to interpret the findings appropriately without missing crucial details that would be important for the audience.

There are 15 designated interview questions and six tasks assigned to observe how visually impaired participants use adaptive technology particularly DETB with SRP to assist learning.

Results & Discussion

Based on the interview and observation conducted, it is noteworthy to understand the need and preference of visually impaired students in adopting the use of the innovation (referred to adaptive technology) effectively assist learning. Functionality of the AT has been identified to be the determining factor why participants choose to use certain AT over another. Functionality of the AT refers to the characteristics of DTTs, including: usefulness of the AT, difficulty, user friendliness and comfortableness are among the characteristics of functionality. Thereupon, the researcher acknowledged the visually impaired participants' interest in utilising DETB with SRP to assist them in education was somewhat due to the result of these characteristics. Whether to utilise DETB with SRP enthusiastically or otherwise, participants understood the characteristics of AT affected their use even though they shared different experiences in using the AT.

Alongside the observation, participants also openly stated experiencing difficulty when using DETB with SRP either from the technical standpoint or from the features, such as: "too many graphics," "take too long to load the entire PDF file," "the conversion of OCR is not accurate" and "will take longer time to complete the tasks."These problems, therefore, certainly discouraged the utilisation of DETB with SRP. This finding is supported with a study by Holcombe (2000), who determined that an innovation with intricate features has a less possibility of being adopted than an innovation with less complexity has a higher possibility.

The researcher discovered that the participants have the awareness-knowledge; which means, they are aware about the existence and benefits of using DETB with SRP to assist their learning. Nonetheless, the researcher found that these participants did not possess sufficient skills to utilise DETB with SRP effectively due to a lack of familiarity and knowledge. The lack thereof will probably cause the participants to be sceptical and doubtful-minded with reference to the effectiveness use of the AT (Baker & Bellordre, 2004). Thus, whether or not visually impaired students adopt the use of DETB with SRP chiefly depends on the level of knowledge and familiarity of themselves.

In this study, the researcher has found out that support from parents, friends as well as school administrators and government have been a critical factor in motivating the adoption of DETB with SRP to assist learning.

On the other hand, there are predominantly two challenges identified by the researcher in stimulating the adoption of AT amongst visual impaired participants. They are "unavailability of DETB" and "the inaccessibility issues." The participants collectively stated that scarcity of DETB and accessibility conundrums due to high graphical images designed with the DETB are the major drawbacks. Hence, the aforesaid factors can negatively impacted the adoption of DETB with SRP.

Participants described the innovation of DETB with SRP as "portable," "sharable," "need less space" and "other Ubiquitous use." These significant benefits would certainly enhance comfortableness when utilising the innovation, and hence, directly link to to adoption of DETB with SRP.

Conclusion and Future Recommendation

This exploratory study is to analyse and interpreted participants with visual impairments' opinions, reflections, and experiences in using innovation, particularly DETB with SRP to assist learning. The findings of this study clearly indicate that by adopting the utilisation of high-tech adaptive technology may enable visually impaired tertiary students to follow the lessons effectively. Even though there are some alternative learning devices which visually impaired students could utilise, they are probably less popular and preferred. For instance, conventional braille textbooks are beneficial to the blinds, but Majority participants unanimously were of the opinion that they are simply too bulky, less portable and hard to be produced.

School administrators have an obligation to promote, introduce and demonstrate the innovation of DETB with SRP to disability resource staff, to lecturers and disabled students by engaging the professionals from the Non Governmental Organisations (NGO) such as Malaysian Association for the Blind (MAB) and teacher specialists in technology. This endeavour can be achieved through in-house trainings for disability resource staff, lecturers and students with visual impairments at designated times to highlight the DETB with SRP, promote the usefulness of DETB with SRP so as to improve the lecturers' teaching and visually impaired students' learning process, and explore all the possible benefits of DETB with SRP to assist learning.

National Education Association (NEA) indicated that training for teachers in the use of technology is the biggest issue in the educational setting (NEA, 2008). When the lecturers are well exposed to the innovation of DETB with SRP, they are likely to furnish visually impaired students readable and accessible electronic notes. This is because lecturers are fully aware what types of electronic reading materials that are accessible for the visually impaired. In addition, lecturers should work hand-in-hand with the disability resource staff in regards to the types of textbooks that they are going to use in the class, and thus, start preparing them electronically in advance. This is certainly time-saving as visually impaired could access and read the content with the SRP right away.

All in all, under no circumstances will the visually impaired students reject the utilisation of DETB with SRP if the main challenges such as unavailability of DETB as well as accessibility conundrums are to be addressed amicably and in sinuously. Hence, for this study, the participants' decisions whether to adopt or to reject the innovation of DETB with SRP were chiefly dependent upon

these emergent findings. This study could be the trailblazer and initial step to understand visually impaired students experiences and understanding in utilising adaptive technology, distinctly DETB with SRP to assist learning.

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Corresponding Author
Grace Annammal Piragasam
Department of Special Education, Faculty of Human Development, Universiti Pendidikan Sultan Idris, Malaysia
Email: grace@fpm.upsi.edu.my

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