
Assistive Technology: a Key Enabler in the Inclusion of Students with Disabilities

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ABSTRACT

People with disabilities (PWDs) frequently face challenges to their enjoyment of academic, social, and community participation and are subjected to discrimination and social exclusion based on their age, gender, ethnicity, social status, language, religion and living environments. Access to assistive technology is a precondition for achieving equal opportunities, enjoying human rights and living in dignity. Over the past decade, evolving technologies have revolutionised the way we do business, communicate, make war, farm, and provide medical treatment. New technologies are also transforming education, and in no domain more dramatically or successfully than in the education of students with disabilities. Use of assistive technology enhances and improves access and participation of PWDs in many life activities. This paper discusses the benefits of assistive technology to students with disabilities (SWDs), and assistive technologies for people with different impairments. Effective use of assistive technologies can help governments in developing countries achieve inclusive education by promoting access and participation in education by students with different impairments. This paper advocates for the utilisation of assistive technologies to provide powerful tools for making learning effective and interesting for learners with disabilities.

Keywords: Assistive technology, inclusion, students with disabilities.

Introduction

Assistive technology enables students with disabilities develop functional skills which enables them to achieve greater independence which will enhance the quality of their lives (Schneider, 1999). When students' quality of life is enhanced, everything else in their lives improves that is school performance, social relationships, family and home life and self-confidence. Boys and girls with disabilities have lower rates of primary school completion than those without disabilities and in many cases, assistive technology can enable them to further develop their learning capacity. Collins and Halverson (2009) assert that the world of education is currently undergoing a massive transformation as a result of the digital revolution. Over the years the types and level of support offered to students with "special needs" and their parents have continued to evolve. This evolutionary process has taken us to a time and place where, with very little exception, technology is now highly regarded by many educators and parents as offering some promise and a considerable degree of hope for students with extraordinary educational needs (White, Wepner, & Wetzel, 2003).

Technology has the potential to contribute to a better quality of life for students with disabilities. It can be a powerful "equalizer" for people with disabilities, allowing them to "get around" a limitation in any number of areas (www.believeability.com, 2009). The use of technology in education is inevitable; it is only a matter of time before schools will fall behind unless they try to catch up. Students spend long hours of their day outside school using technology, so is it reasonable to expect them to come to school and find themselves in the world of no technology and feel attracted to this world. In addition to the factor of attractiveness, there is also the effectiveness of using technology, which has been proven

through some studies. For instance, Patton and Roschelle (2008) argue that digital textbooks offer a better alternative than traditional textbooks because they can provide instant feedback, interactive representations, and the system of universal design for learning (UDL).

Assistive devices and technologies can provide social and emotional benefits to users with disabilities. However, these benefits may be countered by negative side effects, such as stigmatization or feelings of helplessness and dependence on technology.

Defining Assistive Technology and Inclusion

Assistive Technology

There are various definitions of assistive technology. The International Classification of Functioning, Disability, and Health (ICF) defines assistive products and technology as any product, instrument, equipment or technology adapted or specially designed for improving the functioning of a person with a disability (WHO, 2014). Dell, Newton & Petroff (2007) define assistive technology as “any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customised that is used to increase, maintain or improve the functional capabilities of a child with a disability”. These refer to a range of equipment that enables students with disabilities to interact with information. They are sometimes referred to as ‘access technology’, enabling technology’ and adaptive technology’ (Gebrehiwot, 2015). Assistive Technologies is a broad concept, covering virtually anything that might be used to compensate for lack of certain abilities (Reed & Bowser, 2005) ranging from low-tech devices like crutches or a special grip for a pen, to more advanced items like hearing aids and glasses, to high-tech devices such as brailers and computers with specialised software for helping dyslectics to read (WHO, 2009). The International Organisation for Standardisation (ISO) (2011), defines assistive products as any product, especially produced or generally available, that is used by or for persons with disability; for participation, to protect, support, train, measure or substitute for body functions/structure and activities, or to prevent impairments, activity limitations or participation restrictions. This includes devices, equipment, instruments, and software.

Inclusion

Inclusion has remained a very complex concept with different dimensions that have proved to be difficult to define. Thus, there is no single agreed-upon definition of inclusion (Giangreco, Carter, Doyle & Suter 2010:248). UNESCO (2005) defines inclusion as a “process of addressing and responding to the diversity of needs of all learners through increasing participation in learning, cultures, and communities, and reducing exclusion within and from education”. It involves changes and modifications in content, approaches, structures, and strategies, with a common vision which covers all children of the appropriate age range and a conviction that it is the responsibility of the regular system to educate all children. Inclusive education focuses on transforming education systems in a way that they can address the needs of diverse learners as well as emphasizing giving of equal opportunities for students with disabilities to participate in education.

Booth (2003:253) defines inclusive education as, “---the process of increasing the participation of learners in and reducing their exclusion from the curricula, cultures, and communities of neighborhood mainstream centers of learning”. He describes it as an approach to education that is concerned with all learners and with overcoming barriers to all forms of marginalization, exclusion, and underachievement. This approach is therefore concerned with challenging the ways in which educational systems reproduce, perpetuate and maintain social inequalities regarding marginalized and excluded groups of

students across a range of abilities, characteristics, developmental trajectories, and socio-economic circumstances (Liasidou, 2012). Inclusive education is neither 'foreign' nor even 'Western' (except perhaps for the terminology) as it advocates that learners with disabilities should learn alongside their non-disabled peers, which is akin to the calls of 'togetherness' upon which African 'humanness' is grounded. 'Inclusivity' has always been at the heart of Ubuntu and, of course, it has inevitably gone through significant changes influenced by time, space and such factors as colonialism and globalization (Magwa, Podzo & Shava, 2015). It is a response to 'segregated schooling' which was created by the 'capitalist' demands of the global economy that necessitated increased concerns for effectiveness, value for money and competitiveness (Liasidou, 2012). Thus, inclusion entails minimizing all forms of barriers to the education of students with diverse needs.

Rationale for the Inclusion of Students with Disabilities

Inclusion is becoming the ruling principle in the 21st century and the concept of inclusive education is becoming the best way of equalizing opportunities for those with and without disabilities (Mitiku, Alemu, & Mengistu, 2014). Inclusion is not confined to the practice of education alone but can be extended to the larger society. Inclusive education can be viewed from a broader social justice perspective and a human rights issue (Gebrehiwot, 2015). With its agenda for emancipation, inclusion is perceived and embraced amongst people with disabilities and their advocates as an important route that could provide a solution to the problems of people with disability (Chirwa, 2011). The concept is concerned with all learners with a focus on those who have been traditionally excluded from educational opportunities such as learners with special needs and those from ethnic minorities by reducing barriers to learning and developing ordinary learning institutions, which are capable of meeting all their needs. It inculcates sensitivity to challenges faced by others, increases empathy and compassion, improves leadership skills, teamwork and tolerance. According to the literature reviewed, the Salamanca statement of UNESCO- 1994 and the 1948 Universal Declaration of Human Rights are the backbones of inclusive education practices. These two are reinforced by the United Nations Convention on the Rights of Persons with Disabilities (2006) (UNCRPD) according to (Mitiku, et al, 2014). To date, about 155 countries (Zimbabwe included) have ratified the UNCRPD and this commitment by countries to promote and safeguard the rights of PWDs, including the right to education is reflected in the newly adopted Incheon Declaration from the world Education Forum 2015 in Korea (Saebones, 2015). Thus, inclusive education was a response to the quest for strategies to address this basic right of students with disabilities (Gebrehiwot, 2015). The underlying rationale behind inclusive education is that students with disabilities will learn best and develop important social skills that are necessary for their future lives if they are educated in an environment where they would have been taught if they had not been disabled. It is premised on the fundamental principle that every learner belongs to the community, and it essentially promotes a structural re-engineering of all schools or institutions so that they can accommodate the needs of all learners regardless of the nature and severity of their impairment or condition (Magwa, et al, 2015). The process of inclusion thus should be guided by the principles of Universal Design (Phiri, 2003, Butler and McEwan, 2007). Holm (2006) views Universal Design as the design of products and environments usable by all people and to the greatest extent possible without the need to make adaptations or specialized designs (Magwa et al, 2015).

Benefits of Assistive Technology to Persons with Disabilities

Appropriate assistive technology can be a powerful tool to increase PWDs' independence and improve their participation. These are one of the key elements to advance the inclusion of children with disabilities together with additional supports such as personal assistance, sign language interpreters, and removal of barriers. Access to assistive technology for children with disabilities is critical for many to access and benefit from education (UNICEF-WHO, 2015). It can help PWDs become mobile,

communicate more effectively, see and hear better, and participate more fully in the day to day life activities (UNICEF-WHO, 2015). The same source further expresses that assistive technology could be instrumental in the development and health, as well as for participation in various facets of life which include communication, mobility, self-care, household tasks, family relationships, education employment, engagement in play and recreation for people with and without disabilities. Assistive technology supports PWDs to access and enjoy their rights and participate in things they value and it bridges the disparities between people with disabilities and those without. Raskind (1994) points out that the purpose of AT is not to "cure" an impairment but to help people work through their difficulties. In education, the technology could play an important and significant role, in many cases, in helping students with disabilities overcome the academic difficulties that they face and helping them to develop their academic skills as well. Cullen, Richards, and Frank (2008) conducted a study to determine whether computer software would help students with disabilities improve their performance in writing. The results showed that five students out of seven in the study improved the number of words produced. The results showed that the impact on most of the seven students was positive. Another example of the important role that technology can play in helping students to overcome their difficulties with academic skills can be found in the study conducted by (Bouck, Doughty, Taber, Flanagan, Sweed and Bassette, 2010) to examine how effective a pen top computer (a FLYPen) and the writing software (specifically designed for the FLYPen) was in assisting students with disabilities in writing. This tool "resembles a typical pen, larger in size and includes a slot at the top where a software cartridge is inserted. When using special paper created for the FLYPen, the pen top computer produces voice output to provide directions, prompts, reinforcement, and hints to students for various activities" (p. 36). The results showed that all students experienced initial gains in the quality of written expression while using the FLYPen. They concluded that technology-enhanced procedural facilitators not only can benefit the quality and quantity of written expression in students with mild disabilities, but it can also enhance students' ability to plan their writing and help them complete these tasks more independently. Raskind (1994) suggested a number of technologies that may be helpful in assisting students with disabilities overcome their difficulties: word processors, spell-checking programs, proofreading programs, speech recognition, abbreviation expanders, speech synthesis, proofreading programs, optical character recognition systems, Free-Form Databases, and talking Calculators. The same author concluded that spellcheckers were useful in helping students with disabilities compensate for their spelling difficulties. Collins and Halverson (2009) found that the use of word processors helped in improving the writing skills of students with disabilities.

McInerney, Riley, and Osher (1999) examined six projects that have been conducted on students with hearing disabilities, and they found that text highlighting and supportive captions with digital instructional materials were helpful too and demonstrated consistent academic gain for students with hearing disabilities. Davies and Stock (2004) found that exposing students with intellectual disabilities to flexible technologies helped increase their functional skills, take advantage of their strengths, and compensate for their weaknesses. In the same context, Anderson-Inman, Knox-Quinn, and Horney (1996) found that students with learning disabilities have shown an increased academic gain when exposed to technology-supported concept mapping strategies. Elbro, Rasmussen, and Spelling (1996) found that students with language-related disabilities showed positive effects for word recognition, comprehension, and fluency when using digital texts with synthetic, syllable- or letter name-level synthetic speech transformations.

Assistive Technologies for Students with Various Impairments

The use of assistive technology is critical to support learning and teaching of students with special needs. Assistive technology helps a student do something he or she cannot do successfully without it.

Many disabled people inclusive of those with visual impairments have successfully studied science and engineering at undergraduate and post-graduate levels and are now pursuing rewarding careers which were not possible without the use of assistive technologies.

Visual impairment greatly affects a person's ability to read printed materials, thus reducing his/her ability to gain information and thereby making him/her more dependent on others (Dunning, 2009) and, in the case of students, impacts on their ability to access educational materials. Reading and writing are very important functions in the modern world as they provide opportunities to social and economic development (Ferrell, Mason, Young, III and Cooney, 2006). A blind person can only read material in two forms, auditory or tactile (Hollins, 1989). Auditory media include among others another person reading printed material to a visually impaired person, a hired person or the use of technology such as compact disks, tape recorder or specialized computer software like Jaws (Suubi, 2013). Braille is the most common form of representing text in a tactile form (Davis, 2003) and is the basic literacy tool for blind people (Omvig, 2002). Braille is a series of raised dots that can be read with the fingers by people who are blind or whose eyesight is not sufficient for reading printed material (Podzo, Shava, Chakuchichi, Chabata, Chikosi, and Mapwashike, 2017). Visually impaired persons who use Braille are said to achieve better educational levels, have higher employment opportunities and better financial prospects, and have high levels of self-esteem (Ryles, 1996). Clark and Stoner (2008), and Clark-Bischke and Stoner (2009) in their analysis of several research findings on the literacy development of braille users concluded that literacy skills of visually impaired children are the same as those of sighted children. Thus, it is imperative that students with visual impairment are taught how to read and write Braille as well as the use of computers. Although the significance of braille as a means of accessing the written word for people with visual impairment is generally recognized, computers and assistive technologies are becoming increasingly important in helping people with visual impairment access information (Papadopoulos and Koutsoklenis, 2009). The use of assistive technology and computers can greatly facilitate access and participation of visually impaired persons in all facets of life thereby promoting their independence and improve their educational and employment opportunities (Landsberg, 2011, Papadopoulos and Kotsoklenis, 2009). Different educators and higher education institutions (Gebrehiwot, 2015) have provided suggestions on the types of assistive technology that can be used in relation to students with visual impairment. They include the following:

- Screen reader software: This technology helps students with visual impairment to access information displayed on computer screens by speaking aloud through computer screens. The software enables a person with visual impairment to use the computer and surf the internet.
- Scanners: This is software that helps to change print text into a digital text so that it could be read by a screen reader.
- Braille displays: This is a lightweight electromechanical device that is attached to a keyboard of a standard computer which presents the information on a computer as Braille.
- Braille notetakers: These are portable devices through which text can be entered, edited and read back via speech or Braille and printed in Braille and on ink.

There are various technological options and devices available to help students with hearing impairment access and participate in education (Suubi, 2013). The same author gives the following devices which help deaf students access the spoken word, real-time captioning, captioning software, and note-taking software. Other alternatives are computer-assisted note-taking (CAN) and communication access real-time translation (CART), alarm clocks that vibrate the bed, telephone amplifiers, teletypewriter, sensors that detect sound, for example, a baby's cry. The stated technologies are used to provide whole or summarized verbal transcriptions of proceedings in a variety of environments, such as in a lecture room. Hearing aids are some of the devices designed for those with hearing impairment. These amplify sound and make it possible for many hearing-impaired people to hear and communicate. Cochlear implants, behind the ear (BTE) and body worn are examples of hearing aids.

Students with physical disabilities may have difficulty in performing basic functions such as gripping objects with their hands, moving arms or legs in a full or even limited range of motion. These issues can lead to difficulties in the classroom such as using keyboards, touch screens, computer mice, and scroll wheels which are all used with technology. A range of software and assistive technology is available to cater for the various categories and severity of physical impairment. Speech recognition is assistive software that allows people to control a computer by talking to it instead of using a keyboard and a mouse. Instructions are given through a microphone which is connected to the computer. For students with profound conditions and cannot use the ordinary keyboard, some modified ones or mouse, there is an AT which can be operated by slight head movement. Therefore, assistive technology can be very effective in helping students with physical disabilities improve their functional ability in the classrooms.

Challenges Faced by Students with Disabilities in Accessing and Using Assistive Technologies

Access to assistive technology is regarded as a precondition for achieving equal opportunities, enjoying human rights and living in dignity (Standard Rules on the Equalisation of Opportunities for Persons with Disabilities, 1993). Assistive technology is frequently mentioned in the CRPD in Articles 4, 9, 20, 21, 24, 26, 29 and 32 (Borg, 2013 & WHO, 2011). The CRPD requires States Parties to take effective measures to “undertake or promote-----and to promote the availability and use of new technologies, including----- and assistive technologies, suitable for persons with disabilities-----”(CRPD Article 4, 2006). Although assistive technologies are of great use in the lives of persons with disabilities there are several challenges encountered in accessing and using them. The majority of persons with disabilities and their families have limited awareness of assistive products, services and where these can be accessed (Kamaleri & Eide, 2011 and Eide & Kamaleri, 2009). Hence, there is a need for awareness campaigns to address this gap. Disability and poverty are inextricably linked. Poverty is a major contributory factor leading to disability while disability traps people into poverty (Unicef, 2013). It is also worth pointing out that these assistive technologies are rather expensive and therefore difficult to obtain, especially for developing countries as they import most of these (Suubi, 2013:222). All this contribute to high purchasing, maintenance and replacement costs which become prohibitive. Therefore, most people with disabilities cannot afford to buy assistive technologies.

For many States, the provision of assistive technologies is a relatively low area of priority. This could be as a result of lack of political will, relevant legislation, and policies that are in place according to the 2005 Global survey on government action on implementation of the Standard Rules on the Equalisation of Opportunities for Persons with Disabilities.

Studies carried out revealed that students with various impairments lack the relevant skills which enable them to use assistive technologies like computers (Gebrehiwot, 2014). The same author also expressed that the use of computers by students with visual impairment was limited due to the lack of totally disproportionate number of computers with appropriate software. All these have contributed to major barriers to access and use of assistive technology by students with disabilities (Borg, Lindstrom & Larsson, 2009). All these challenges can be minimised by enacting and enforcing relevant legislation and policies, government subsidies as well as removing import duty on assistive technology. Students with disabilities should be equipped with the relevant skills through training as well (Gebrehiwot, 2014).

Conclusion

Assistive technology is instrumental in the inclusion of students with disabilities as these are very effective in helping them improve their functional ability in the classrooms. With the advancement of new technology students with disabilities now have the opportunity to access, participate and be

educated in the regular education setting. Using technology has helped students with disabilities enhance and improve their independence in academic and employment tasks and their participation in classroom discussions, along with helping them to accomplish some difficult academic tasks. Thus, it is crucial that educators and staff be aware of the types of software devices available since technology is changing at a rapid pace.

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