

Assistive and Digital Technology for the Education of Students with Visual Disabilities

Prabhu P¹, Dr. J. Sujathamalini², G. Ravichandran³

^{1,2,3}Department of Special Education and Rehabilitation Science, Alagappa University, Karaikudi, India

Corresponding Author: Prabhu P

DOI: <https://doi.org/10.52403/ijrr.20230287>

ABSTRACT

In education, assistive technology resources applied to education for visual impairment students can be defined as computers and mobility that allow students to access the digital environment, promoting an individual life. Technology enhances reading and writing skills as well as communication with the world and improves their quality of life, the learning process and academic excellence. Digital technology for a low vision or totally blind students can be able to communicate with schools' databases, stores, and libraries. Digital technology has mainly required computers for all students, teachers as well as for pedagogical support. This thematic paper applies content review methodology and analytically summarized the ideas. The conclusion of the paper states that technology provides independence to students with visual impairment by enhancing their communication, mobility, and environmental control. In many cases, the use of technology is the only way people with communication difficulties can connect to the external world.

Keywords: Visual Impairment, Assistive Technology, Digital Technology

INTRODUCTION

Technology in Education refers to hardware and software, including the internet and related low-tech devices. The use of technology in education is always as a welcome sign as it enables both teachers and students to gain knowledge at a much better and faster rate. Technology in education is not limited to make use of

technology to make learning and imparting education easier in all possible ways but is also a field of study in itself for those who are involved with developing technological tools for educational purposes. Keeping in mind the end-user which was the students and teachers, technologists are busy inventing tools and gadgets for use in classrooms.

According to the federal "Assistive technology is any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain or improve functional capabilities of individuals with disabilities". The importance of technology in education to the teachers can collaborate to share their ideas and resources, student can develop valuable skill at a young age, students and teachers have access of materials etc.

NEED FOR THE STUDY

Kiyota (2022) et. al. studied on Effects of Social Implementation Education for Assistive Device Engineers at NIT (KOSEN) through the Development of a Digital Reading Device for the Visually Impaired. The study conducted an evaluation experiment in which students from a technical college experienced visual impairment in the same blindfolded environment as visually impaired people to evaluate the developed assistive device. To verify its importance, they developed a digital text-to-speech system for the visually

impaired, “Touch Talker”, as part of the GEAR 5.0 program. The results of the experiment showed that the developed “Touch Talker” was effective for both the visually impaired group and the blindfolded technical college student group. The evaluation results also showed a similar trend, confirming that the evaluation by blindfolded technical college students is effective for the development of assistive devices for the visually impaired.

Leria, L. A., Benitez, P., & Fraga, F. J. (2021) has conducted a study on Assistive technology in large-scale assessments for students with visual impairments: A systematic review and recommendations based on the Brazilian reality. Currently, computer-based tests are widely used in large-scale assessments in education. However, the effective participation of people with visual impairments (PwVI) through the use of Assistive Technologies (ATs) to take these tests equitably and independently is an open challenge, particularly in countries with high social inequality, as Brazil. The present study systematically mapped the ATs used by PwVI to access digital information in large-scale assessments. Based on the systematic literature review methodology, 3012 articles from four scientific databases were retrieved, of which 28 were considered for analysis. The results point to a wide range of ATs to make tests accessible, as well as to a trend towards the implementation of global solutions through important partnerships and consortia. Such initiatives present proposals for accessible, reusable, and interoperable technology solutions that promote access to examinations based on the concept of universal design, in order to guarantee the right to education for everyone, including PwVI. Furthermore, systematic review indicated that research on the topic concentrates in some countries (e.g., U.S.). Lastly, the study found out that there is a research gap regarding how to implement and expand the use of these technologies in regions with rather different realities in terms of access to digital

information, financial resources and ease of access to technology by PwVI.

Tuwaym, B., Turki, S., & Berry, A. B. (2018) explored Assistive Technology for Students with Visual Impairments: A Resource for Teachers, Parents, and Students. Assistive technology (AT) for students with visual impairments (VI) is an essential part of their educational program. AT allows students to develop skills, engage in the academic environment, and function independently. Despite the Individuals with Disabilities Education Act (IDEA) mandate for AT as part of a student's Individualized Education Program (IEP), research has found that rural schools use fewer AT devices when compared with urban schools. The extent of AT use is significantly determined by the level of teachers' training and their familiarity with AT. The authors present an AT resource they created to provide teachers and parents with current, helpful information on AT for students with VI. The resource details (a) application/devices about which teachers need to know more, (b) the type of VI with which an application/device is most helpful, (c) key features, (d) cost, (e) sources for additional information, (f) product guides and research evaluating the AT, and (g) organizations that provide additional information.

Kapperman, Gayle Kelly, et, al. [2018] conducted a study on Using the JAWS Screen Reader and the Focus Braille Display to Read Foreign Language Books Downloaded from the Book share Accessible Online Library, Methods commonly used to enhance the language-learning experiences of students who are visually impaired (that is, those who are blind or have low vision), are not sufficient for foreign language learning. There are several challenges involved in the study of foreign languages by students who are visually impaired. One of the most pressing of these challenges is that teachers of students with visual impairments provide Braille copies of all instructional materials in the foreign language. If the teacher is not

familiar with the foreign language the student is studying, it becomes even more difficult to provide the required workbooks, textbooks, and other materials to be transcribed into the foreign language. Likewise, those teachers who are unfamiliar with the foreign language may not know how to pronounce the special accented letters when providing instruction to their students regarding the Braille symbols used to represent these letters. The authors recommend a Windows-based computer equipped with one of the latest versions of Job Access with Speech (JAWS) and a Focus Braille display. In the instructions provided, the authors assume that the computer user has sufficient knowledge to download books from Book share. If this is not the case, the authors recommend that detailed instructions be acquired from the Book share website JAWS comes "out of the box" from the manufacturer with preinstalled software that allows it to recognize eight different languages in addition to English when the cursor moves over content that has been "tagged" for the language in question. The steps that need to be taken to enable JAWS to recognize foreign languages in Book share books are also provided in detail. Using the steps outlined in this article, students who are visually impaired can have full access to published materials written in various foreign languages.

Ostrowski, & Christopher P. et. al. (2016) conducted a study on Improving Access to Accommodations: Reducing Political and Institutional Barriers for Canadian Postsecondary Students with Visual Impairments, Challenges in obtaining qualities academic accommodations for students with visual impairments in postsecondary education hinder accessibility and the success of such students. The limitations of current policies and practices intended to address the needs of students in Canada are examined and potential solutions are discussed. Further systemic changes are needed to improve the quality and timeliness of accommodations.

ASSISTIVE TECHNOLOGY

Assistive technology means it helps to ease accessible scientific devices for the people. The assistive technology is helping to use many educational materials for individual with disabilities. Assistive technology is nothing but including mobility devices (cane, walker, wheel chair etc.), hardware and software, computerized devices also. Assistive technology acts important role in the education of individuals with visual impairments. The visual impairment person has faced many barriers in the teaching learning process of education field. But assistive technologies were providing good features in our education for visual impairments. Examples large print keyboards, mp3 players etc.

Assistive technology has two types, Low tech and high tech assistive technologies. Low tech devices are Braille slate, talyor frame, abacus, Perkins Braille writer, Braille watches and optical magnifiers, etc. High tech devices are portable video magnifiers, smart phones, tablets, navigation aids, zoom max, Esight, Iris Vision, accessible mobile apps, Braille translators, CCTVs, digital talking book players (hardware/ software).

DIGITAL TECHNOLOGY

Digital technologies are electronic tools, systems, devices and resources that generate store or process data. Well-known examples include social media, online games, multimedia and mobile phones. Digital learning is any type of learning that uses technology. It can happen across all curriculum learning areas.

EPUB

According to techopedia "an electronic publication (EPUB) is an e-book file format that has the extension of .EPUB. Electronic publications can be downloaded and then read using devices like daisy player, android and i-phone, tablets, e-readers and computers. EPUB format is a multiple formatting technology. Available formats are DAISY, Mp3, Large print, BRF.

1. DAISY FORMAT

DAISY is made to be a complete audio substitute for print material and is specifically designed for use by people with disabilities including blindness and low vision. It is based on the MP3 and XML formats, the DAISY format has advanced features in addition to those of a traditional audio book.

2. Mp3

Mp3 formats are used for a student who is blind or visually impaired to access print and information. This format can help the student access information easily, but be aware that listening to books on tape is not the same as literacy.

3. LARGE PRINT

Low vision persons will frequently need materials to be increased in size. Careful consideration must be made when choosing to use large print.

4. BRF

A refreshable Braille display is an electronic device for visual impairment. It helps to read computerized texts. This device is using BRF format.

SCREEN READERS

The screen reader helps to read in computer text to audio format immediately by student with visual impairment.

CAMERA SCANNERS, OCR AND TEXT -TO-SPEECH MATERIALS & METHODS

This device is used to scan and read on book texts to transcript audio (voice-over) format for visual impairment. It's very useful in the education of students with visual impairment.

TECH TACTILE GRAPHICS MATERIALS RESULT

Swell-Form Graphics II Machine

The Swell-Form Graphics Machine is a simple and fast creating a tactile maps, text and diagrams. This machine has creating a

tactile image for visual impairment students. It is low cost method. It has unique features like auto start and stop and consistent. The heat reacts to the black ink and swells, creating a tactile image. It is user-friendly and high quality after each use.

Picture in a Flash Tactile Graphic Maker (PIAF)

Picture in a Flash (PIAF) is a simple method of preparing a tactile graphics. This machine can make raised line on special paper. It's called swell paper. First user can draw, print pictures in the swell paper and insert into picture in flash. The heat produces into the lines they react to the carbon in the ink, and then read with the fingers.

Thermoform Machine

A Thermoform Machine is a way to reproduce Braille text and tactile graphics. First to use, place a master copy or model onto the machine, then place a sheet of specialized plastic material, on top of it and close the clamp. Once clamp was closed and the slide heating element to the front and wait a few seconds when it is removed, there is tactual graphics of the master copy.

ORCAM MYEYE PRO

To decipher the world around them, blind people employ all of their four remaining senses, particularly sound with the brain using auditory cues to create mental images. That's the premise behind the Or Cam My Eye Pro. This cutting-edge technology helps those who are completely blind make sense of the visual world by describing what they can't see.

A small wireless smart camera about the size of your index finger attaches with a magnet to the arm of any eyeglasses. Point your finger or tap the touch bar and the camera will capture an image of what's in front of you and communicate the info audibly through a tiny speaker that rests above the ear. It makes shopping easier scanning barcodes and identifying the denomination of the bill you're holding.

MATHEMATIC AND SCIENCE DEVICES FOR STUDENTS WITH VISUAL IMPAIRMENT

Mathematical devices are very useful to visual impairment students. There are some mathematical devices like Braille watches, tap see, talking calculators and math flash software. Science devices for visual impairment are pre-made tactual graphics, tactile astronomy, liquid level indicators, talking digital scales, talking thermometer, video microscope.

The Above assistive technology will be helpful for students with visual impairment to precede their higher education without any hindrance. The students can explore print information with these assistive technology and study on par with their peer groups. The present study aims to explore the utility of this assistive technology by the students with visual impairment.

METHODOLOGY

This thematic paper applies content review methodology and had gone through the contents related to the topic and analytically summarized the ideas.

Objectives of the Study:

- To explore different assistive and digital technologies available in education for students with visual impairment.

DISCUSSION

Certain factors inhibit the learning process of visually impaired students. Assistive Technology is very supportive of them to face such obstacles easily and spontaneously. We experience some things that have progressed in daily life in line with this stage. We benefit the most from it. It is the basis of our progress. As well as assistive technology devices that are well-suited to the academic advancement of visually impaired students, many advances have been made to suit this stage. Students with visual impairments benefit greatly from the use of Assistive technologies related to advance digital technology for

educational application and improvement in them.

The current technology EPUB has many features. These are suitable for the visually impaired for their educational reading and learning experience of all people. This technology called EPUB comes in a variety of formats. All visual impairments in this format can use the books they want online or by converting them to EPUB format. By using this they gain quality learning experience in their education.

Similarly, Braille related technologies and technologies based on each subject are more and more equipped with digitalized technologies as adapted to such period. They are also suitable for visually impaired students as they give a pleasant experience to their learning approach. Students will have the opportunity to receive a clear and quality education as the pictures in the book will be modified in a hierarchical manner.

CONCLUSION

Digital technology is helping us a lot, as well as blossoming a new hopeful life for visually impaired students. Assistive Technology devices have evolved over time to give new hope to visually impaired students who are unable to function spontaneously. Such progress-based devices are set up digitally. These computer-based technologies are the foundation for the knowledge development of visually impaired students. Such technologies also help the visually impaired student to fully acquire all the educational knowledge that a normal student can acquire without any hindrance. It is hoped that the devices that help to improve the ability of students with high levels of visual impairment will be more effective in the future than they are now. Therefore, tend to welcome emerging technological devices in line with the emerging culture.

Declaration by Authors

Acknowledgement: This paper was presented in the National Conference on National Education Policy 2020:

Implications for teacher education organized by University Institute of Teachers Training and Research, Chandigarh University on 3rd June, 2022.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Carmen Willings, Science adaptations, <https://www.teachingvisuallyimpaired.com/science-adaptations.html>

2. Susan Osterhaus, Teaching math to students who are blind or visually impaired, <https://www.perkinselearning.org/videos/webcast/teaching-math-students-who-are-blind-or-visually-impaired>

How to cite this article: Prabhu P, J. Sujathamalini, G. Ravichandran. Assistive and digital technology for the education of students with visual disabilities. *International Journal of Research and Review*. 2023; 10(2): 714-719. DOI: <https://doi.org/10.52403/ijrr.20230287>
