Enabling Education of Children with Visual Impairment in Schools through Assistive Technology

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DOI: 10.47750/pnr.2022.13.S06.220

Abstract

Technology has emerged as a revolution in all walks of life. It has contributed significantly in empowering the disabled human race and help them overcome previously insurmountable barriers which led to their seclusion and ignorance.

Assistive technology in particular has helped the students with low vision and blindness in accessing the curriculum.

Technology should be considered as one of the important components of teaching learning material in an inclusive setup. Teachers need to make use of Assistive Technology to promote inclusion and meet the varied requirements needs of the students in the same class.

A variety of Assistive Technology (AT) devices are available that can help teachers facilitate the process of curriculum transaction in the classroom and bridge the educational needs of students with disabilities. Research has proven evidences that technology has a significant impact on learning of the students in the areas of STEM and language learning as well particularly in reading and writing.

This paper discusses the various assistive technologies which can be utilized for promoting inclusion and leveling the playfield of students with blindness in particular.

It is the responsibility of the teacher to integrate the student with visual impairment as much as possible with all the relevant adoptions as could be and transact the curriculum to her/him effectively. To do this, the teachers must first be aware of what all adoptions and technologies exist and how they could be utilized in the classroom for effective delivery of the lessons and mainstreaming the children with visual impairment.

Keywords: Assistive Technology, Inclusion, Mainstreaming, Visual Impairment.

INTRODUCTION

The term Inclusion has revolutionized the perspectives of the stakeholders in education and has ushered in the much-required equality between the sighted and non-sighted students in terms of the environment, classroom, curriculum and other amenities that a student requires in the educational setting. This has led to improvement in the confidence of the students with disabilities and has motivated them to come forward and exhibit their latent talents and boosted their self-esteem. With this change in perspective and approach, has also emerged the need to understand the customized requirements of children with disabilities and methods to address them equitably in the classroom. Addressing the individual needs in a common classroom implies all students, with or without disabilities are able to gain education and have the access to same curriculum and utilize the same resources and services. This arrangement holds that the education system be flexible and is able to assimilate the requirements of diversified learners. It adapts itself to cater to those needs and ensures that everyone has a positive mindset and celebrate diversity rather than considering it a problem.

Students with blindness face various problems in the learning environment. They must gain access to the curriculum across all subjects. They also shall participate in the classroom activities. They deal with understanding the abstract and visual contents which is a large part of any regular curriculum. The students with visual disabilities in an inclusive classroom need to be equipped with the right tools and technology to enable them to independently address these day to day challenges.
Defining Assistive Technology

Assistive technology is used as a comprehensive term for both assistive products and related services. AT is a which is interchangeably used for rehabilitative devices, adaptive devices and technology that assists and addresses the gaps and improves the functions of persons with disabilities on day to day basis.

According to Goddard(2004), “‘any item, piece of equipment or product system that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities, and help them to work around or compensate for a disability”

Assistive Technology outlines a bouquet of products, devices, softwares, strategies, technology solutions and services that supplements the person’s needs, tasks and abilities. It also evaluates the custom needs of individuals and complements the existing programs for rehabilitation and inclusion.

Role of Assistive Technology

According to Lowenfield(1973), children with blindness encounter two major challenges in their day to day life. 1) Independent traveling and 2) lack of meaningful experiences. They require Assistive technology to address these challenges.

1. Use of appropriate devices helps them in accomplishing tasks that they were earlier unable to perform, or faced a greater difficulty while performing them.

2. Integration of suitable and Effective technology provides all students the ability to study and get access to the general curriculum, and simultaneously enable them to accomplish their work in multiple ways and means with independence and greater ease.

3. Assistive Technology increases, maintains and improves learning outcomes of students with special needs and helps them overcome ‘functional barriers’ in the diverse world of expectations and abilities.

4. Ahmad (2015), stated that due to lack of necessary support and the means for equal participation, students with disabilities are found to be frequently trapped in a vicious cycle of exclusion from education, society and mainstream development programs To a great extent, assistive technology helps in bridging this gap and offer multiple opportunities to contribute and participate.

5. Assistive technology helps students with visual impairment achieve success in education and become self-reliant. It provides them means to get access to information and effective communication.

6. According to Kelly & Smith (2011), acquisition of literacy, equal access to information that is required for employment, and access to information have been promoted by Assistive technology.

Use of Assistive Technology in Inclusive Education

“The real miracle of technology may be the capacity it has to remove previously insurmountable barriers faced by persons with disabilities”. Simon (1991). Technology has a great potential of providing equal access to all students. It enables access to general school curriculum and facilitates inclusion.

“The National Association for the Education of Young Children (NAEYC) has stated that technology should be employed as an active part of the learning process” (p.255). Lee (2006) also supports the statement and stated, “assistive technology is an important piece of the whole support system individuals with learning disabilities require to achieve success”. Technology acts as a wagon which drives the current century and teachers should make use of it in their curriculum transaction with a goal to address the diverse needs of all the students that they teach.

There are several Assistive Technology (AT) and adaptive devices that are available that can help teachers meet the unmet needs of specially abled students. Glaser & Hassel bring and (2000) advocated that, “teachers have found that technological innovations can help level the playing field for special needs students and enable these students to succeed in the regular classroom”.
Assistive Technology for Various Subjects at School Level

Assistive Technology for Mathematics

Mathematics is a subject that has a lot of visual content and content that is of abstract nature. Due to this it becomes one of the most challenging subjects for children with low vision and blindness. Use of 2D and wherever possible, 3D items to represent Mathematical concepts, of space, graphs, angles and tables is essential in mental mapping of these abstract concepts.

- Abacus – Basic concepts of Mathematics at early stages can easily be grasped with the help of Abacus by children with visual impairment. It is a substitute of a calculator and through its tactile and colourful beads becomes a very easy instrument to teach Mathematical concepts like numbers, fractions etc.

- For teaching Math concepts in primary grades, Tactile, Braille and Visually attractive Math manipulatives play a critical role. They continue to play a vital role in grasping Math as students’ progress into middle and secondary schools. Here is a list of manipulatives and other adaptations that may be helpful for a CVI:

  Tactile Manipulatives

1. Geo-boards are useful for teaching graphs, spatial relations or shapes.

2. Braille Taylor frame with 18 lines having 25 cells in a row-A simple device for performing complex mathematical calculations. It consists of small openings or cells arranged in different rows, in which rectangular pegs or types made of led / plastic are fitted to form numbers, signs or letters

3. Tactile manipulatives for grasping concepts like shape, texture, size and other properties.

4. Geometric tactile manipulatives are other innovative devices that can be used to teach concepts like spatial relationships, area & angles and also helps a child to draw geometric diagrams.

5. Braille or tactile number line

6. Fraction tactile manipulatives and puzzles

7. Braille or large print dice can be used to play a variety of math games and reinforce number recognition simultaneously.
8. While reinforcing the concepts of horizontal, vertical and diagonal, large print/braille Bingo cards can be helpful in teaching students to quickly scan for numbers

9. Adaptive/Talking Calculators- These calculators come with diverse features and functionalities. Calculators with 5-function support, scientific calculators and graphic calculators. These calculators have large keys with large displays to aid children with low vision and they also have talking feature for students with blindness.

10. Tactile drawing net boards- can draw tactile diagrams on a plain paper. Useful for teachers to geometrical concepts.

Assistive Technology for Social Studies and Science Subjects

- Graphic Tactile Drawings, maps, tables and graphs can be enlarged, outlined with 3D glue, can be modified to retain the useful visual content and information.

- Tactile graphics can be created using thermoforming sheet, swell paper, or an embosser. Braille labels may also be added to maps.

- 3-D representations of objects and models can be procured from vendors, borrowed from museums, or created using common objects. Multisensory representation of objects enhances the experience of the learner and makes it much more meaningful than relying solely on tactile graphics. These objects can also be made using 3d printers.

- In addition to the adaptive measuring items such as talking scales and thermometer, large print, tactile, or braille measuring tools are more useful in the science lab.

- Mobiles with related apps are available with audio& output in speech. A variety of subject related collection of data and its analysis can be done through it.

Visually Enhanced or Tactile Graphics

Adaptive Devices for Physical Education and Art

Students with blindness and low vision require assistive technology and adaptations to feel included in the school activities and participate at par in areas of art, culture, music, games etc..

Physical education gives a wonderful opportunity to students with visual impairments to practice various skills like orientation and mobility. It also helps in experiencing the freedom of movement, and development of healthy habits. Participation in these activities can be facilitated with the help of a range of low-tech adaptations, modifications and specialized equipment.

Cricket and Football are the most popular sports among visually impaired people which they can play with the help of acoustic balls (plastic ball filled with iron bearings) in which minor adaptations can be done to adapt it for visually impaired players. Players can wear bells to provide auditory cues. Goal ball is an internationally recognised sport that is not yet common in India. The players have to solely depend on auditory and tactile cues.
- Tactile Chess Board- It is a tactile wooden or plastic chess set with tactile floor which has raised and lowered squares to mark two different colours of white and black. This helps to easily distinguish between the colour zone. Each peg also has a protrusion at the bottom that fits into the board holes and allows the players to explore the board with ease.

Tactile Chess Board 1

- Playing cards which have braille symbols can be used for playing different games by Visually Impaired persons.

Playing cards

- Simple games like Ludo and snakes and ladder having tactile symbols can be played for excursion by visually Impaired persons.

- With the help of Tandem bicycles a student with blindness and a sighted student can together participate in excursion and physical activities.

Tandem bicycles

- Tactile boundaries can be provided to a playing area by using tape and string, while high contrast tape can provide visual cues.

- To participate in track activities, A tether, or short guide rope, can be used with a sighted peer.

- During bowling, guide rails can be used.
A variety of textured material like textured fabrics, textured glass, wire or plastic mesh, paper mache, clay, finger prints provide textures and materials lead to a rich sensory experience in art.

A variety of objects should be added to create a tactile interest and depth.

Special materials like embossed pictures, tactile drawing board, swell paper, or tactile diagram kits may be useful for art and craft work and learning other educational concepts.

Conclusion

Regular schools with an inclusive orientation are found to be most effective in combating discriminatory attitudes, building an inclusive society and achieving education for all (UNESCO, 1994). Assistive technology should not be viewed by educators within a ‘rehabilitative’ or ‘remediative’ context, but as a tool for accessing curriculum, and exploring out means to help students achieve positive outcomes (Warger, 1998). For the proper and optimum use of assistive devices, it is essential to ensure need-based assessment - considering the applicability of the technology and its effectiveness; a sound development plan - ensuring student centred goals and proper identification in the plan of the devices needed; successful implementation - through action oriented approach to check the feasibility and effectiveness of the technology, with effective monitoring and periodic review.

There is a distinct need for researchers, practitioners, and other stakeholders in the system to identify ways to encourage the development of tools, and strategies and innovative programmes for technology integration, and strive to work together on issues surrounding the use of technology, for effective inclusion of students with disabilities within the general education environment, ensuring that they are entitled to the same high standards and effective instruction that is available to the non-disabled students. It is essential to focus and build on the strengths and capabilities of the students, with the necessary support and assistance, to give more room to their abilities in order to address their 'disabilities'.
REFERENCES