Role of Assistive Technology in Inclusive Classrooms

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Abstract: After India's independence, many legislative policies came into existence for the children with disabilities. The main purpose of this is to provide equal educational opportunities to all the children irrespective of their disabilities. Various educational provisions came into existence like special schools, integration, mainstreaming and inclusive education. Inclusive Education is the latest concept in the field of education. It aims to provide education to children with special needs in regular schools. Inclusive education as a notion ensures that school must recognize and respond to the diverse needs of their students and ensuring quality education to all through appropriate curriculum, organizational arrangements, teaching strategies, resource use and partnership with their communities. To promote inclusive education the role of assistive technology is important as it helps the children with special needs to perform tasks independently that they were formerly unable to accomplish, or had great difficulty in accomplishing, by providing enhancements to or changed methods of interacting with the technology needed to accomplish such tasks. Within this broader framework, the paper aims to provide the concept of inclusive education in general, difference between Integrated and Inclusive Education, relationship between Universal Design for Learning and Assistive Technology, different types of assistive technologies used in providing quality education to children with special needs in regular classrooms and existing challenges and suggest the remedial strategies for the utilisation of assistive technology in inclusive education.

Keywords: Children with special needs, Assistive Technology, Inclusive Education, Challenges and Remedial Strategies

Introduction

"Education then, beyond all the other devices of human origin, is the great equaliser of the conditions of men-the balance-wheel of the social machinery."- Horace Mann

'Inclusion' a recent step in special education remains a complex and controversial issue but has been accepted and interpreted innumerably. Inclusive Education aimed at catering to the educational needs of all children who are vulnerable to exclusion due to their specific problems and circumstances. Inclusion in context of the special education means the process of educating children with and without Special Education Needs (SEN) in general education system with specially designed instruction and support system in the curriculum, examination, methodology and classroom environment for attaining successful learning from the part of the learners.

The principle of inclusive education was adopted at the "World Conference on Special Needs Education: Access and Quality" (Salamanca Statement, Spain 1994 as cited in Singh, 2016) and was restated at the World Education Forum (Dakar, Senegal 2000 as cited in Singh, 2016). The Statement solicits governments to give the highest priority to making education systems inclusive and adopt the principle of inclusive education as a matter of policy. The idea of inclusion is further supported by the United Nation's Standard Rules on Equalization of Opportunities for Person with Disability Proclaiming Participation and equality for all (Singh, 2016).

According to UNICEF 2007, Inclusive Education (IE) is defined as a process of addressing the diverse needs of all learners by reducing barriers to, and within the learning environment. It means attending the age appropriate class of the child's local school, with individually tailored support. I

Inclusion does not mean 'dumping'. Inclusion is a basic value that extends to all children. Inclusion gives a message "Everyone belongs to the school- Everyone is welcome to the school."

Inclusion is based on the philosophy that all students are different in any number of ways (not limited to disability), and in order to meet their learning needs, schools need to adapt and change their practices. (Kineslla and Senior, 2008 & Oliver, 1990).

Integrated and Inclusive Education

The integration of children with special educational needs in the ordinary school has been a key topic in special education for the last 25 years. However, more recently, the term 'inclusion' has been used in place of Integrated Education. Integration is dependent on external agency; children are offered places in the 'least restrictive environment' and integration becomes a matter of 'placement decisions' (Fish, 1985 as cited in Avramidis, Bayliss, & Burden, 2000). Such placement decisions are seen as failing some children because integration may not meet specific needs of children with significant disabilities. This is because integration as a process does not imply restructuring of educational environment to accommodate the needs of a small number of children with significant disabilities (Thomas, 1997 as cited in Avramidis, Bayliss, & Burden, 2000). By contrast, inclusion implies such a restructuring of mainstream schooling that every school can accommodate every child irrespective of disability (accommodation rather than assimilation) and ensures that all learners belong to community.

In Integrated Education, the child is seen as a problem and not a system. S/he is considered to be different from others and if s/he cannot learn it is her/his problem. Hence, integrated education is based on the medical model of disability. Inclusive Education on the other hand, is all about effective learning by all children including children with disability and considers that if the child is not learning then the system needs to be blamed. Inclusive Education emphasises equality of education and not mere placement in education. Integrated Education can be a stepping stone for inclusive education (Julka, 2007).

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Child is a Problem in INTEGRATED EDUCATION	System is a Problem in INCLUSIVE EDUCATION

(Source: Julka, 2007)

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Objectives:
1. To find out concept of Universal Design for Learning (UDL) and interrelation between Universal Design for Learning and Assistive Technology.
2. To find out different types of Assistive Technologies used in providing quality education to children with special needs in regular classrooms.
3. To find out the benefits of using Assistive Technologies for CWSNs in Inclusive classrooms.
4. To access the barriers in using Assistive Technologies and the remedial measures in overcoming the barriers.

Universal Design for Learning (UDL)
The origin of the term UDL is generally attributed to David Rose, Annie Meyer and the colleagues at the centre from Applied Special Technology (CAST). The principles of UDL were developed by Individuals with Disabilities Education Act (IDEA) in 1997. At that time the students with disabilities were placed in general classrooms in inclusive settings. As the students with disabilities had gained physical access to general education classrooms but the main concern being raised about how students would gain "access to the general curriculum".
Universal Design for Learning (UDL) provides the opportunity for all students to access, participate in, and progress in the general education curriculum by reducing the barriers to instruction. UDL offers options for how information is presented, how students respond or demonstrate their knowledge and skills and how students are engaged in learning.
According to Higher Education Opportunity Act 2008, universal design for learning means a scientifically valid framework for guiding educational practice that: (a) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and (b) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient (as cited in National Centre on Universal Design for Learning, 2013).

Assistive Technology
The term AT is generic and used to describe assistive, adaptive and rehabilitative devices for people with varying degrees of disability (Maor, Currie & Drewry, 2011*).* Assistive devices are tools designed to improve the functioning of individuals with disabilities and reduce the effects of environmental barriers. They range from low-tech or simple devices (eg., walkers or pencil grips) to high-tech ones (eg., power wheelchairs or computerised communication systems) (Huang, Sudgen & Beveridge, 2009).
      Assistive Technology (AT) is any device used to increase, maintain, or improve the functional capabilities of a child with a disability. By decreasing student's dependence on others, AT can increase the likelihood of functional independence and consequently, increase the possibility of inclusion in the general education setting.

How Universal Design for Learning and Assistive Technology are interrelated?
Some individuals believe that AT and UDL are identical or conversely, antithetical. But AT and UDL are different, are completely complementary to each other. The advances in one approach prompt advances in other. UDL and AT often work in concern to achieve optimal and practical results (Hitchsock & Stahl, 2003).
      The UDL framework is based in the neuroscience of learning, and its principles emphasize three key aspects of pedagogy: the means of representing information, the means for the expression of knowledge and the means of engagement in learning (Rose and Meyer, 2002). By implementing the UDL principles the application of AT becomes more accessible to use by CWSNs. UDL has goals similar to those of AT, including over aching goal of increasing the access, participation and progress of students with disabilities. In AT, technology is used at the level of individual student to help him or her to overcome barriers in the curriculum and learning environment while in UDL, technology is used to create curricula and environment that reduces the barriers in learning.

Types of Assistive Technology
It may be important to note that not all the technologies are appropriate for all individuals. People have their own unique set of strengths, weaknesses, interests, experiences and special abilities. Therefore, a technology that may be a blessing for one purpose may be useless for another. So, when choosing an assistive technology, consider the specific individual, the setting and the task(s) to be performed.
The following are the assistive technologies for children with different types of disability:

Technologies for Students with Hearing Impairment:
Any device that is used to enhance a person's residual hearing is referred to as an assistive listening device (ALD).
Students with Hearing Impairment are who have a hearing loss that interferes with their ability to process linguistic information through auditory channels with or without amplification. In Indian Classrooms, most of the students have been diagnosed with some type of hearing impairment that interferes with their ability to function without some type of assistive device.
- **Hearing Aids:** These are generally used in four styles: body-worn, behind the ear, eye-glass and in-the-ear. School-age children most often use *postauricular* hearing aids, which are designed use behind the ear.

- **Frequency-Modulated (FM) Amplification Systems:** FM transmission device creates a direct link between a teacher, who wears a microphone, and the student, who wears a hearing aid. In this system, background sound is reduced and the teacher and student can easily communicate without any distraction.
- **Cochlear Implants:** The Cochlear Implant is surgically placed beneath the skin, it bypasses the damaged parts of the inner ear and stimulates nerves that have not been stimulated before. Signals are sent continuously when sound is present in the environment, but special circuitry in the speech processor reduces unwanted background noise.

Technologies for Students with Visual Impairment:

The term "visual impairment" describes a broad range of visual abilities and needs. Following are the Assistive Technologies for the students with visual impairment:

- **Enlarged Text:** For students with some existing visual function, providing text information in enlarged format may be the simplest strategy. Enlarged text can be acquired through a variety of sources, including vendors, or materials modified through the magnification feature of copy machines, while text size of most digital materials can be easily adjusted to a user's preference.
- **Braille:** Braille is an essential tool for teaching literacy skills and will serve as a lifelong skill. Learning Braille allows students to experience aspects of written language such as spelling, grammar and sentence structure and will provide a valuable foundation for written language.
- **Braille Labeler:** Labeling items throughout the student's environment will not only reinforce vocabulary, spelling and reading but swill also promote independence and assist with orientation.
- **Adaptive Paper:** Specialized paper with darkened lines, raised lines, or using colour can significantly improve the writing of students with low vision.
- **Braille Embosser:** A braille embosser allow the student to print out their completed work in braille format.
- **Arithmetic and Braille Writing Slate:** This has an Arithmetic Slate on one side and a Writing Slate on the other. It also has reversible type clamp and two guide lines supplied with a wooden stylus.
- **Abacus:** It is used to teach early number concepts, operations and fractions, can be used in lieu of paper and pencil, and is a low-tech substitute for a calculator.

Technologies for Students with Locomotor Disability

The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act of 1995 has defined Locomotor Disability as the disability of bones, joints or muscles leading to substantial restriction of the movement of the limbs or any form of cerebral palsy (Ratra, 2007).

World Health Organisation (1980) has defined Locomotor Disability as "a disability to an individual's ability to execute distinctive activities associated with moving, both himself and objects from place to place." (Ratra, 2007)

The Assistive Devices used for Locomotor Impairment are :

- **Wheelchairs:** Despite rapid progress in the field of science and technology, there has been very little innovation in wheelchair design over the last 200-300 years. The folding wheelchair came in 1933, and powered wheelchairs were developed in the early 1970s. Wheelchairs are devices that can be manually propelled or electrically propelled. Wheelchairs allow people with physical disabilities to perform mobility-related daily activities. Now a days standing wheelchairs are also available that prevent the secondary problems like pressure sores and also allow the users to interact with other standing people.
- **Prosthetics:** Prosthesis is an artificial device that replaces a missing body part, which may be lost through trauma, disease, or congenital conditions. Prosthetics are intended to restore the normal functions of the missing body part. The basic goal of a prosthetic device is to provide a disabled person an aid that can perform the function of one or more limbs.
- **Saathi Walker:** It is a project developed by Rehabilitation Research and Device Development (R2D2) lab at IIT Madras. It is a self-propelled mobility device for children with locomotor disability. The project aims at developing an affordable, ergonomic independent mobility device for such children who may otherwise be able to walk only with support from a caregiver. It includes a seat and a sit-to-stand mechanism so that the child can stay in the device for longer periods of time.

Technologies for Students with Learning Disabilities

According to Edyburn, the term Learning Disability means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations, including such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia.

The Assistive Technologies used for Learning Disabilities are as follows:

- **Electronic Worksheets**: Students with learning disabilities like dyslexia can use electronic worksheets to complete their assignments. These worksheets help students to line up words, equations and numbers on their assignments.
- **Audio books and publications:** Recorded books allow users to listen to text and are available in a variety of formats, such as audiocassettes, CDs, and MP3 downloads. Special playback units allow users to and search and bookmark pages and chapters. Subscription services offer extensive electronic library collections.
- **Talking Calculators:** Talking Calculators are greatly beneficial for the students who have dyscalculia. The gadget makes it easier to check assignments, read numbers and perform calculations. Other than talking calculators, students can also check out text-to-voice devices. They function on the same concept of converting written words into an audible track. Students can use these devices to check their spelling or to improve their reading comprehension skills.
- **Word Processors:** Word Processors are computer-based writing systems that enable the user to type text onto a computer screen before printing on paper. Word processors allow the user to edit and correct his written work more efficiently than doing so by hand. Text is also easily underlined, boldfaced or centred. The ability to rearrange text in these ways may reduce a writer's fear of making errors, since the text can be easily changed.

Benefits of Using Assistive Devices

Assistive Technology makes children with disabilities to be more independent, productive and included in the society and community life. The benefits of assistive technology were first recognized by Congress in 1988 when it passed the Technology-Related Assistance for Individuals with Disabilities Act (Public Law 108-446), as amended in 1994 (also known as the Tech Act). Congress reiterated its intent to enable students with disabilities to be included into society through technology by incorporating the Tech Act definition of assistive technology into the disabled students Individual Education Plan (IEP) (Sagstetter, 2002).

1. **Enhance Academic Achievement:** Assistive Devices enhance participation and achievement of students with disabilities in their educational programs. Assistive Devices fulfils the needs of students with disabilities in academic areas like reading, writing, spelling and maths.
2. **Makes the child independent:** Assistive technology devices are only the beginning of a long road to independence, not the end (Fleisch, 1989). With the help of Assistive Technology children with significant disabilities can increase their meaningful participation across school, home, work, and community settings. According to Levin and Scherfenberg (1990), technology is the gift our generation can give to many children and adults with significant disabilities. Technology can increase access to new experiences, new activities and new environments, bridging the gap imposed by a disability.
3. **Augmentative Communication:** Students with severe expressive communication impairments have difficulty in communication with peers and adults within their environments. Many of these students need a means of supplementing their communication skills. These students frequently use augmentative communication technology. Various devices like object based communication displays, picture communication boards and books, talking switches, voice output communication devices and computer based communication devices helps speech impaired children.
4. **Interact in Educational or Social Environment:** Assistive technology enhances the chances for students who have a wide range of physical and intellectual disabilities to be more autonomous and interact in educational or social environments. Through assistive technology equipment learners can learn specific social and educational tasks in the least preventive setting.
5. **Helps in Social Development:** Assistive technology helps the disabled students in their social development. In most cases, these students find it hard to connect with their normal peers, making it difficult for them to make friends and hence face isolation and sometimes depression. Thus, it helps in developing self-determination, self-advocacy and independent living skills.

Barriers to use Assistive Technology in Inclusive Classrooms

1. **Lack of teacher training:** In developing country like India, there is no provision of providing training to the teacher for the use of AT in inclusive classrooms. There are limited opportunities for teachers to learn appropriate strategies for selecting, purchasing, evaluating and customizing AT devices. Many teachers have limited knowledge of the most basic AT devices. In a survey of 405 teachers, only 19% believed that they had adequate AT training (Derer et. al., 1996). Even the teachers who have pursued formal training in the area do not believe that they have the skills to use the technology effectively. Students with Learning Disabilities are not able to utilise, select the ATs in inclusive classrooms.

   Proper training should be provided to teachers so that they can understand their functioning. Workshops or in service training programmes must be organised. Administrative support is necessary in this regard. Formal preservice training programmes should be improved. Knowledge regarding AT should be given to the prospective teachers.
2. **Attitudinal Barriers:** Attitudinal Barriers are considered to be the most important barrier in the use of AT in inclusive classrooms. They are reflected in misconceptions, stereotypes, fear from unknown, resistance and lead to isolation of children with disabilities. It has been observed that the teachers themselves not willing to support the use of AT in classrooms. As a result, students with learning disabilities may not easily rely on assistive technology. Thus, teachers themselves encourage the students to use of assistive technology in the classrooms and also should be open to experimentation with the new trends in education.
3. **Lack of funding for AT devices:** AT devices are quiet costly for both students and teachers. AT requires a lot of funds for their purchase as well as maintenance. ATs help the students with disabilities to achieve academic independence and success. Various NGOs and funding agencies provide fund for Assistive Devices. There should be a liaison with the agencies or service providers who can help students acquire the technology needed to enhance the learning.
4. **Lack of awareness:** Many people with disabilities and their families have limited awareness of assistive products and services. This makes it difficult for children and their families to know what assistive devices are available or suitable and how they can be beneficial.
5. **Inaccessible Environment:** Physically or cognitively inaccessible environments act as barriers to assistive technology. Physical barriers include stairs or poor lighting, while cognitive barriers include texts that are not clear or symbols that are difficult to understand. Further, regardless of the cost or availability of a wheelchair, a child will not be able to use it in an inaccessible house, road or school.

Conclusion

Assistive Technology has been a missing link in the chain of prerequisites that enable the children with disabilities to lead a life where they enjoy and exercise their rights rather than being deprived of them. Assistive Technology makes the children with disabilities independent. They allow the children with disabilities to participate fully in all the activities of the daily life. They help in developing self-confident, self-determination and develop social skills in them. Thus, prepare them for their future. Teachers can easily make adaptations in their instructions according to the needs of the children. So, we can say that AT proves to be boon for children with disabilities.

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