



# INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

## ASSISTIVE TECHNOLOGIES FOR DIFFERENTLY- ABLED STUDENTS

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### ABSTRACT

Education For All is a global concept aimed at achieving the objectives of reaching every citizen in the world irrespective of gender, religion, economic class, age, disability, and other discriminations. ‘No child left behind’ should be a global educational reform. India, with its New Education Policy 2020, strives to fulfill the commitment towards and equitable and inclusive education system. Equity and inclusivity in education will bring together children, youth, and adults to become efficient citizens of the nation. A large proportion of children in India belong to differently-abled group, who are still struggling to receive basic literacy in their life. The efforts made by countries around the world towards the education of this group are ever increasing now. In this context of education of special children, the researcher explored the various tools and technologies available, and their use. This paper focused on the growth of assistive technologies (ATs) in India and elsewhere, the awareness of these technologies among the students and the actual use. The data was collected from various literature available on ATs, the source organizations developing these technologies, and the government resources. The findings revealed the significance of assistive technologies, their relevance in inclusive classrooms and use. The paper suggested the ways in which assistive technologies can be more effectively incorporated in the education system to make it more meaningful and how both the teachers and students can become more competent in solving their educational needs. During COVID outbreak, the online teaching- learning system has revolutionized the creation, development and distribution of assistive technologies. It was suggested in the paper to make these technologies affordable, economical and easy to use for students belonging to differently-abled groups.

Keywords: Assistive technologies, NEP-2020, Disability, Special Education, Differently-abled

### INTRODUCTION

*“Barrier-free access to education for all children with disability”*

*New Education Policy, 2020*

The education system has grown over the years keeping in view the needs and demands of students, teachers and society. There is an emergence of online teaching and learning with the advent of new technologies. Globalization is a key feature of our education system, with students and teachers moving across the world to fulfill their learning needs. In the population of the world, there is a huge number of students who are special children, or differently-abled. The changes in the education system should cater to each section of society irrespective of any differences or bias. We cannot neglect the needs of those groups who require some extra effort, special care and attention to achieve the objectives of learning. The capabilities of these differently-abled

children are innumerable, however the classroom conditions sometimes do not help them much. As a result of technological advancement and solutions offered by technology in every sector of economic growth, we expect some innovative changes in the education field as well, esp. for the benefit of differently-abled students. Thus, the creation and development of Assistive Technologies for helping these students so that they can think, work and learn in their best of capacities. There are technologies which have been categorized as low-tech and high-tech solutions for the purpose of learning. Assistive technologies refer to some digital device, any hardware and software which has been designed to assist or help people with some special need. The use of technologies like web 2.0 by students have been used by students in higher education in their teaching-learning process. [1] The functions of assistive technologies may vary like, some help in providing physical movement, some in learning, some as teaching aids, etc.

## WHAT IS DISABILITY?

The Preamble to the Convention on the Rights of Persons with Disabilities (CRPD)- 2006, adopted by the United Nations, described disability by stating that:

*“Disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinder their full and effective participation in society on an equal basis with others.”*

“Persons with disabilities include those who have long term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.”

WHO defines ‘Disability’ as *“an umbrella term, covering impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Thus, disability is a complex phenomenon, reflecting an interaction between features of a person’s body and features of society in which he or she lives.”*

These above definitions of the term ‘disability’ cover all aspects of individual’s life and development. It includes areas like physical, emotional, social, intellectual, cognitive, sensory etc. which may hinder the normal work efficiency of an individual. However, it is important to note that it is not ‘inability’, but the different ways in which an individual can perform the same activity as a normal person would do, only with some extra effort, care, treatment or rehabilitation.

## STATISTICAL DATA OF DISABILITY IN INDIA

The Census 2021, conducted by the Office of the Registrar General and Census Commissioner, India, is the source for latest data on disabled persons in India. It has brought to light some important points to notice, which are as follows [2]:

1. “Citing Census 2011, the report states that there are 26.8 million persons with disabilities in India, making up 2.21 per cent of the total population.
2. There are 14.9 million males and 11.9 million females with disabilities in India – accounting for 56 and 44 per cent of the total population of disabled persons.
3. About 2.41 per cent of India’s male population and 2.01 per cent of its female population reports having a disability.
4. As many as 18 million persons with disabilities (69 per cent of the disabled population) live in rural India, and about eight million (31 per cent) live in urban areas.
5. The report presents data on the number of persons with different kinds of disabilities in the country. It says that 20 per cent of persons with disabilities report impairments in movement, 19 per cent face disability in seeing, 19 per cent in hearing, and seven per cent in speech. The report notes that six per cent of the disabled population faces ‘mental retardation’ or intellectual disability which results in difficulty in understanding, comprehension or communication.
6. **According to Census 2011 data, 61 per cent of children with disabilities (aged 5-19 years) are in an educational institution, 12 per cent have been in such institutions in the past, and 27 per cent have never attended one. The report states that 50 per cent of children with mental disabilities have never attended any educational institution.**

7. The report states that 22.4 per cent of the disabled population in rural areas, and 19.9 per cent in urban areas, reported receiving aid or help from the government.
8. The Constitution of India guarantees “equality, freedom, justice and dignity” of all individuals – the report notes. The Ministry of Social Justice and Empowerment, in May 2012, established the Department of Empowerment of Persons with Disabilities (Divyangjan) to ensure focused attention to policy issues related to persons with disabilities and work towards their empowerment. Some of the critical schemes introduced by the government of India for the welfare of persons with disabilities are Deendayal Disabled Rehabilitation Scheme which aims to provide grants to non-governmental organizations for projects involving the rehabilitation of persons with disabilities, and related activities.”

### 45% Of Indians With Special Needs Are Illiterate

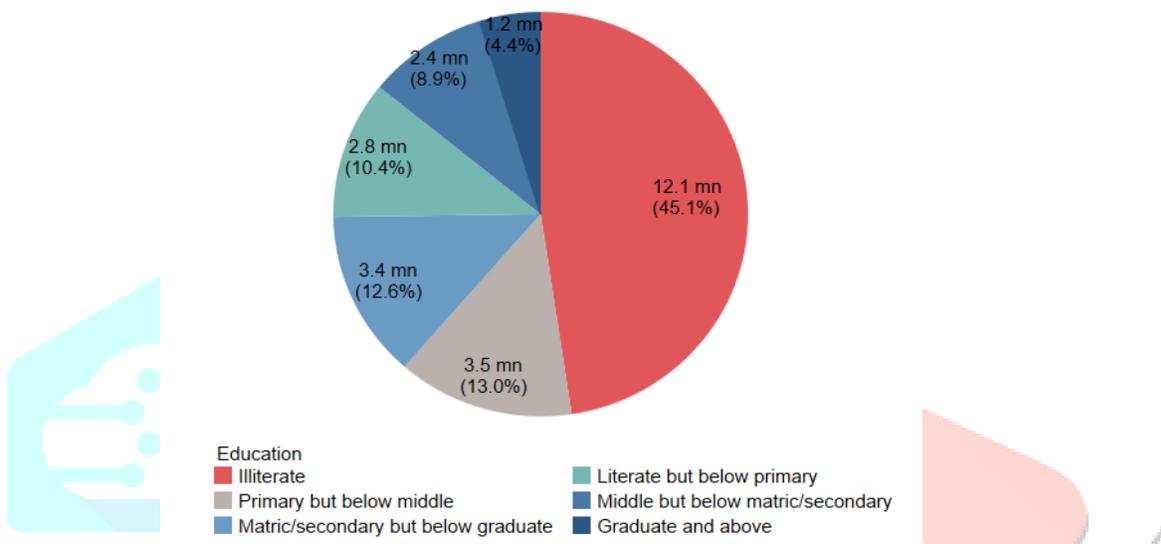


Fig. 1 Educational status of individuals with special needs in India

(Report by Government of India, Ministry of Statistics and Programme Implementation, National Statistical Office, Social Statistics Division. 2021)

The Census 2011 showed that, at all India level,

- Among the total disabled persons, 45% are illiterates. 13% of the disabled population has metric/ secondary education but are not graduates and 5% are graduates and above. Nearly 8.5% among the disabled literates are graduates.
- Among the male disabled persons, 38% are illiterates. 16% of the disabled male population has metric/ secondary education but are not graduates and 6% are graduates and above. About 9% among the male disabled literates are graduates.
- Among the female disabled persons, 55% are illiterates. 9% of the disabled female population has metric/ secondary education but are not graduates and 3% are graduates and above. Nearly, 7.7% among the female disabled literates are graduates.

The statistics and data mentioned in Census 2011 are indicative of the status of disabled population, the gender-wise distribution, their literacy rate, the qualification wise percentage, etc. The increasing numbers in each category of disability emphasize the need to seriously analyze the conditions of education system with respect to special need children. Sincere efforts are required to provide accessibility and awareness to this group of the population. The new technologies can become helpful in solving the problems of awareness, access and learning needs of differently-abled children.

## LEGAL PROVISIONS FOR DIFFERENTY- ABLED GROUP

In India, several legal Acts and provisions have come into being from time to time for recognizing the special need children, their rights and recommended efforts towards their holistic development. They are as follows:

- 1) The Mental Health Act, 1987
- 2) The Rehabilitation Council of India Act, 1992
- 3) Person with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995
- 4) The National Trust for the Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disabilities Act, 1999
- 5) Rights of Persons with Disabilities (RPWD) Act, 2016:- The Act replaces the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. The Act covers the following specified disabilities [2]:
  - i) Blindness
  - ii) Low vision
  - iii) Leprosy Cured persons
  - iv) Hearing Impairment (deaf and hard of hearing)
  - v) Locomotor Disability
  - vi) Dwarfism
  - vii) Intellectual Disability
  - viii) Mental Illness
  - ix) Autism Spectrum Disorder
  - x) Cerebral Palsy
  - xi) Muscular Dystrophy
  - xii) Chronic Neurological conditions
  - xiii) Specific Learning Disabilities
  - xiv) Multiple Sclerosis
  - xv) Speech and Language disability
  - xvi) Thalassemia
  - xvii) Hemophilia
  - xviii) Sickle Cell disease
  - xix) Multiple Disabilities including deaf- blindness
  - xx) Acid Attack victims
  - xxi) Parkinson's disease.

## NEW EDUCATION POLICY(NEP) 2020 AND SPECIAL EDUCATION

The New Education Policy stressed the importance of 'equity' and 'inclusion' in education system in India. There is emphasis on community participation in this policy towards achieving the goals of inclusive classrooms, completely removing disparities based on any kind of disability. *"NEP aims to ensure equity and inclusion in and through education by addressing all forms of exclusion and marginalization, disparity, vulnerability and inequality in education access, participation, retention and completion and in learning outcomes."* [3]

There is special consideration given in the policy framework to follow the RPWD Act 2016 for providing barrier- free education all children in India. Special mention is of establishing resource centers in the country to provide resources for rehabilitation and education to children. Appointment of trained special educators and teachers in schools has also been emphasized. Funding to provide assistive technologies for special need children also holds a place in the document. *"Assistive devices, appropriate technology-based tools and language-appropriate teaching-learning materials will be made available. Also, high-quality modules to teach Indian Sign Language, and to teach other basic subjects using Indian Sign Language will be developed for NIOS."* [4] Sincere efforts and cooperation from teachers, students, policy makers, technology developers and community will be required to put NEP recommendations into practice. This will bring our education system closer to attainment of sustainable development goals (SDGs) and promote learner- centered approaches in the education system. [5]

In the next section, we discuss the assistive technologies which are used by teachers, students and educationists for catering to the learning needs of special groups.

### Assistive Technologies (ATs)

According to the International Organization for Standardization:

*“Any product (including devices, equipment, instruments and software), especially produced or generally available, used by or for persons with disability: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions.” [6]*

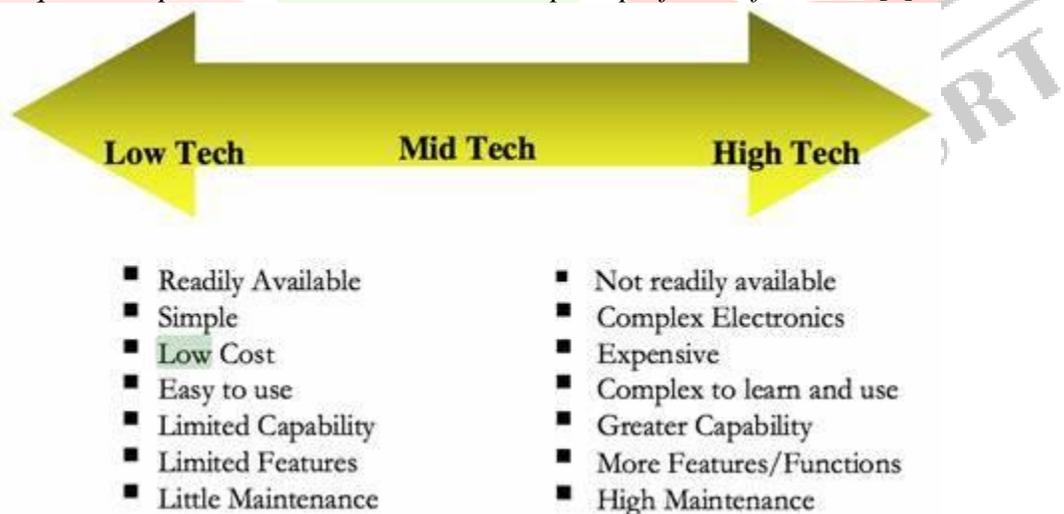
According to Hasselbring and Bausch (2006):

- (1) Assistive Technology is an empowering aid,
- (2) Assistive Technology helps individuals compensate when remediation problems persist,
- (3) Assistive Technology promotes independence, decreases reliance on others, and enables Children with disabilities to learn those skills of independence and self-sufficiency. assistive technology has been able to provide students with varying disabilities an opportunity to experience a greater amount of independence and success within their learning environment. Hutinger (1994) studied assistive technology usage in educational programs with children who have significant disabilities. [7] The Individuals with Disabilities Education Improvement Act (IDEA, 2004) states that an AT device is defined as *“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 the functional capabilities of a child with a disability.” [8]*

### CLASSIFICATION OF ASSISTIVE TECHNOLOGIES

Assistive technology has the capacity to increase students’ independence and participation in classroom activities. Several authors have come up with different ways by which assistive technology can be classified; for example, Gitlow (2000) states that assistive technology can be classified into three, according to their levels, these are:

- 1. *Low-tech assistive technology: Assistive technology devices that fall under this level are usually very easy to use, cost less and have no need for electricity to work.*
- 2. *Mid-tech assistive devices: These types of devices are easy to operate but require electricity to work. They cost more than the low-tech devices.*
- 3. *High tech assistive devices: These devices are usually complex and programmable and include items that require computers, electronics or microchips to perform a function. [9]*



(Photo courtesy: Google images [10])

## SURVEY DATA, ANALYSIS AND FINDINGS

An attempt was made by the author in this paper to prepare a list of Assistive technologies used by students for their educational needs. These ATs are listed in the following table specifying their purpose as well.

CATEGORY/ AREA OF FUNCTION	ASSISTIVE TECHNOLOGIES	NEED AND RELEVANCE IN CLASSROOM LEARNING
Reading	Electronic books, Book adapted for page turning, Single word scanners, Predictable texts, Tabs, Talking electronic devices/software, Speech Software	For students having difficulty in reading and understanding written text and in paying attention to the reading assigned
Writing	Pen/Pencil grips, Templates, Word processors, Word card/book/wall, software, Spelling/Grammar checker, Adapted papers	For students having problems in writing or composition
Math	Calculators, Talking Clocks, Enlarged Worksheets, Voice Output Measuring Devices, Scientific Calculators	For students having computational problems and confusions, and finding it difficult to perform well in Math lessons
Vision	Eyeglasses, Magnified, Screen Magnification, Screen Reader, Braille Large Print Books, CCTV, Audio Lesson Tapes	For students who have difficulty in seeing or lack complete vision
Hearing	Hearing Aids, Pen and paper, Signaling Devices, Closed Captioning	For students who have difficulty in hearing or are absolute hearing impaired
Computer Access	Word prediction, Alternative Keyboards, Pointing Option, Switches, Voice recognition Software	For students finding it difficult to access the computer in its standard form and have difficulty in performing academic tasks
Augmentative/ Alternative Communication	Communication Board, Device with speech synthesis for typing, Eye gaze board/frame, Voice output device	For students having problems in comprehension of language, and lacking the ability to express it, or are unclear in speech and demonstrate delayed expressive language

This study was conducted by the author to analyze the awareness and use of Assistive technologies by students of teacher training course in Aligarh. The sample consisted of a total of 150 students. The data was tabulated and systematically analyzed, with the help of Microsoft Excel. The following results were obtained based on the objectives of the study:

**Objective 1:** To analyze the awareness about assistive technologies among students

Table 1: Awareness about assistive technology of students in higher education

Level of Awareness about ATs	Percentage of students (%)
No Awareness	24.7
Low Awareness	8.07
Average Awareness	41.3
High Awareness	25.3

**Objective 2:** To find out common assistive technologies widely known by students

Table 2: Showing the common assistive technology widely known by students in higher education

Assistive Technology for various disabilities	Percentage of the students using assistive technology (%)
Assistive Technology for Visually Impaired	63.4
Assistive Technology for Hearing Impaired	68.7
Assistive Technology for Reading Impaired	58.7
Assistive Technology for Writing Impaired	44.0
Assistive Technology for Mathematically Impaired	54.7

## CONCLUSION

From the findings of the present study, it was concluded that the awareness level is high about assistive technologies among majority of students. The demanding use of the internet to acquire knowledge can be one of the reasons for high awareness about ATs. The present research has considered five types of assistive technology for various disabilities, namely visually impaired, reading impaired, hearing impaired, writing impaired and mathematically impaired. The results concluded that most of the students were frequently using assistive technology for hearing impairment in their learning process, but they are not expert users. The theoretical background on assistive technologies and their actual usage by students were discussed in this paper to throw light on the status of ATs in India. Keeping in view the emphasis laid down by NEP 2020, it becomes imperative for teachers and educationists to utilize the availability and accessibility resources in guiding students belonging to differently-abled groups. The results of this survey suggest that awareness drive should be conducted to help the differently-abled students to make use of the right technology in their learning process. Also, appropriate training and workshops need to be organized in a timely manner to help teachers as well as students to use the ATs and keep themselves updated about any new developments. Technologists should devise innovative, simple and affordable assistive technologies to cater to the educational needs of the special population to make their lives easier and efficient.

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