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Research Paper

Use of Technology in Creating Inclusive Classrooms: Bridging Barriers to Learning

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ABSTRACT

Examines the capacity for transformation of educational technology (EdTech) in promoting equity in learning environments while highlighting the persistent challenges that marginalized communities face, including digital divides, limited access to resources, and socioeconomic disparities that impede educational attainment. The quick adoption of technology in the classroom has created new opportunities for students of all backgrounds and skill levels to succeed and for diversity promotion. In order to provide fair access and specialized support for a range of student requirements, this manuscript examines how digital technology and innovations might remove obstacles to learning. With an emphasis on assistive technology, adaptive learning platforms, and innovative technologies such as virtual reality (VR), augmented reality (AR), and artificial intelligence (AI), this manuscript explores the relationship between technology and inclusive pedagogy. It assists educators in developing collaborative, interesting, and accessible learning environments by utilizing empirically supported methodologies, real-world case studies, and practical tactics. Digital equity, teacher readiness, and ethical issues like data security and privacy are only a few of the significant subjects covered in this chapter. By providing readers with useful concepts and viewpoints, it functions as a comprehensive resource for converting classrooms into inclusive environments where each student can realize their full potential.

Keywords: *Inclusive Education, Assistive Technology, Adaptive Learning, Artificial Intelligence (AI) in Education, Virtual Reality (VR)*

1. To explore and understand the concept of inclusivity in education.

Quality education within the context of the general education system should be available to all students, regardless of their abilities. In recent years, there has been a paradigm shift in the perception of special education, moving away from a separated approach and toward a model that is inclusive. This change has occurred as a result of several factors. This movement acknowledges the significance of integrating students with disabilities into regular educational environments, with the goals of facilitating the students' social integration and promoting their academic accomplishments. The advancements that have

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been made in special education can be attributed to a number of different sources, such as legal reforms, scientific discoveries, and the acknowledgement of the rights of those who have impairments. Legal frameworks, such as the Rights of Persons with Disabilities Act, have played a significant part in advocating for inclusive education and ensuring that the rights of children with disabilities are safeguarded in the process. Because of these legislative regulations, an increased emphasis has been placed on the necessity of providing students with disabilities with equal access, non-discrimination, reasonable accommodations, and support services. A system of education known as inclusive education (IE) includes professors, universities, curricula, and methods of instruction and evaluation for both students with and without special needs. (Mihas, 2017, pp. 125–134) IE is the process of implementing an inclusive educational system. In the Indian context, IE is essential for a number of reasons. Many social, linguistic, and cultural backgrounds are represented in India's population, which is renowned for its diversity (Panda & Gupta, 2004, pp. 27–49). According to Aced et al. (2009), pages 27–38, IE is a teaching method that acknowledges and celebrates the intrinsic diversity and heterogeneity among pupils, ensuring that every child, regardless of disability, has an equal and fair chance to get a top-notch education. Through successfully addressing each child's unique needs .IE aims to provide all children, disabled or not, with access to a first-rate education by attending to their needs in a flexible, considerate, compassionate, and supportive manner. (Pages 231–242, Barton, 1997)**.** "IE is not just about enabling students who had previously been denied access to mainstream schools; it is rather about placing them in the same mainstream system," Barton said. There is respect for individuality (Loreman, 2007, pp. 22–38). To ensure that all children and adolescents may participate in education and that all forms of discriminatory behavior are eradicated, current educational systems must adjust to the physical characteristics of children, curricular components, instructional strategies, standards, and leadership positions (Barton, 1997, pp. 231–242). The goal of inclusive education (IE) is to provide equal, high-quality learning opportunities by integrating all students, regardless of ability, into regular classroom environments. IE, which is based on the principles of social justice, equity, and respect, places a strong emphasis on acknowledging individual learning requirements and diversity (Mihas, 2017; Aced et al., 2009). Due to the sociocultural and linguistic variety of the nation as well as historical disparities in educational access, IE is especially important in the Indian context (Panda & Gupta, 2004; Bose, 2012). Importantly, IE transforms the idea of special education or segregated classrooms into inclusive settings where students with and without disabilities can learn side by side. Barton (1997) and Loreman (2007), inclusion encompasses more than just a student's physical location in a school; it also involves their active engagement, respect, and value as a learner. However, structural reforms—such as adjustments to curriculum design, teacher preparation, infrastructure, and evaluation—are necessary for such an approach to have any real impact.

A strong basis for encouraging inclusive practices has been established in India by legislative frameworks such as the Rights of Persons with Disabilities Act (2016) and the Right to Education Act (2009). These laws aid in the institutionalization of IE by requiring nondiscrimination, equal chances, and reasonable accommodations. However, implementation is still uneven, largely because of inadequate infrastructure, unprepared teachers, and a lack of awareness. As the author correctly points out, IE supports social inclusion, economic growth, and global competitiveness in addition to educational equity (Hanushek et al., 2008; Rieser, 2012). It seeks to eliminate stigma, promote tolerance, and develop a workforce that is varied and talented. These results, however, rely significantly on

efficient implementation, ongoing stakeholder involvement, and resource distribution—areas in which India continues to have difficulties.

Additionally, even though IE is marketed as a revolutionary strategy, there is a crucial contradiction between policy and practice. Due to social stigma, a lack of support networks in schools, and restricted accessibility, many students with disabilities continue to be underserved in practice, despite policies that promote inclusion. In India, the concept of inclusive education is both important and desired. Policy and awareness have made great strides, but systemic change, capacity building, and a cultural shift in perspectives on disability and difference are necessary for practical manifestation. Meaningful inclusion is a continuous process that necessitates deep community engagement at all levels as well as strategic commitment.

2. To examine the role of Information and Communication Technology (ICT) in promoting inclusive education

"The most effective weapon we can use to change the world is education," as Nelson Mandela once stated. Inequality in education, particularly in developing nations, is regrettably impeding international attempts to use education to transform the globe. One noteworthy initiative to provide access to educational technology is the "One-laptop-per-child" (OLPC) program, which has been implemented in a number of nations. OLPC programs that solely use computers to teach have very little impact, according to research on the subject done in Colombia utilizing a two-year randomized experiment on more than 5000 youngsters. The findings of similar studies carried out in Peru, Uruguay, Brazil, and Costa Rica are consistent: OLPC programs by themselves do not enhance children's academic performance, even though they enhance "digital skills.

Only a small number of study endeavors have marginally beneficial effects; additional technology-access-only treatments undertaken in Israel, Romania, and other parts of the world discover comparable findings. The idea highlights how crucial it is to provide a welcoming and inclusive learning atmosphere that offers all students, regardless of their backgrounds or skill levels, equal opportunity. Because of the speed at which technology is developing, more and more research is being done on how technology might promote inclusive education. A variety of tools and platforms that are accessible to students with special needs are included in the use of technology in inclusive education. Examples include gamification-based learning applications for kids with developmental disabilities or screen reader software for students who are blind or visually impaired. Furthermore, technology enables educators to adapt their teaching strategies to more effectively meet the unique requirements of every student, enhancing the efficiency of the teaching and learning process. Therefore, the incorporation of technology into inclusive education not only enhances accessibility but also helps all students achieve greater learning results. Technology is viewed not only as a tool for teaching but also as a driving force behind an inclusive learning environment and the advancement of equitable access for all students. Cullen et al. (2019) and Díaz-Gandasegui & Soro (2021) have demonstrated that effective technology integration can assist in overcoming conventional obstacles to inclusive education, including the digital divide, a lack of resources, and difficulties in meeting the particular requirements of students.

Therefore, more individualized learning is made possible by technology, letting students study at their own pace and with their own demands. Therefore, the educational gap between pupils from different origins can be lessened with the usage of technology. All things

considered, incorporating technology into the classroom not only increases the efficacy of instruction but also fosters an environment that is more egalitarian and inclusive for all students. The employment of assistive technology to help students with impairments is one area that has drawn a lot of attention. For students with special needs, such as those with learning disabilities, physical disabilities, or sensory impairments, these technologies can enhance access, engagement, and academic performance (Alnahdi, 2020; Gokool-Baurhoo & Mbera, 2023). Screen reader software, other keyboards, and mobility assistance are a few examples. Additionally, digital technology has been crucial in making distant learning possible. Since many schools were compelled to adopt an online learning approach due to the COVID-19 epidemic, this has become especially pertinent (Basilica & Kvavadze, 2020; Hodges et al., 2020).

Even though there are issues with quality and accessibility, online learning platforms have contributed to the continuity of education and given students in different circumstances flexibility. A more inclusive pedagogical approach and tailored learning have also become possible as a result of technology utilization. Teachers can adapt teaching methods and learning resources to each student's learning style, interests, and talents by using artificial intelligence (AI) and learning analytics (Pardo et al., 2019; Zawaki-Richter et al., 2022). This makes it possible for instruction to be more tailored to each student's unique needs. Therefore, technology is a catalyst for change in educational processes as well as a learning tool. The capacity to evaluate student learning data in real-time gives teachers the chance to deliver more rapid and precise instruction.

Furthermore, by enhancing student motivation and engagement, these technologies' personalization and inclusivity can produce a more productive and pleasurable learning environment. But it's crucial to remember that there are drawbacks to integrating technology into the classroom. The literature now raises serious concerns about issues including the digital divide, inadequate teacher preparation, and data privacy (Henrie et al., 2020; U. G. Sahoo et al., 2021). As such, a thorough and all-encompassing strategy is required to guarantee that technology actually promotes fairness and inclusion in education. To tackle this issue, current studies have shown how crucial it is to help teachers and students become more digitally literate. The term "digital literacy" describes the capacity to access, assess, and use technology sensibly and successfully (Vuorikari & colleagues, 2022). Teachers and students may maximize the use of technology in the classroom and make sure it is used in an ethical and inclusive manner by increasing digital literacy.

Collaboration amongst many stakeholders, including governments, academic institutions, non-profits, and the technology sector, is also essential to advancing inclusion through technology. These collaborations can help with curriculum creation, teacher training, and resource sharing to meet the unique needs of each community (Griful-Freixenet et al., 2020; Sánchez-Riera et al., 2021). Creating and implementing rules that encourage the use of technology for educational inclusion is also essential on a larger scale. According to Korma (2022) and Tattoo and Florida (2023), these policies could include technology access equity initiatives, accessibility requirements, and ethical guidelines for the use of technology in the classroom. With a solid policy framework in place, efforts to promote inclusivity through technology may be planned and carried out more successfully. This will give all students, particularly those from underrepresented groups, equitable access to high-quality education. Furthermore, it is important to keep in mind that incorporating technology into the classroom is not without its challenges, which is why clear and stringent standards are

essential. Inadequate teacher training, the digital divide, and data privacy concerns have become prominent issues in the literature (Henrie et al., 2020; U. G. Sahoo et al., 2021).

As such, a thorough and all-encompassing strategy is required to guarantee that technology actually promotes fairness and inclusion in education. To tackle this issue, current studies have shown how crucial it is to help teachers and students become more digitally literate. Digital literacy is the capacity to access, assess, and use technology in an efficient and responsible manner (Vuorikari et al., 2022). Despite the difficulties, case studies and actual data demonstrate that, when used properly, technology may improve educational inclusion. As an illustration, studies conducted in a number of European nations have demonstrated that the use of assistive technology can enhance students with disabilities' academic performance and involvement (Miesenberger et al., 2020; Scherer et al., 2021). Research from Latin America shows how distance learning based on technology has made helps reach people in remote areas and makes education easier for pupils from disadvantaged backgrounds (Cobo et al., 2020; Oliveira et al., 2022).

Incorporating technology into the classroom can create more fair learning opportunities and lessen the digital divide. With the correct use of technology, educators may also help students learn in ways that are more tailored to their individual requirements. For this reason, in order to improve educational inclusiveness, legislators and educators must keep researching and maximizing the use of technology. Technology is not a panacea for every issue in inclusive education, though, so it's crucial to keep that in mind. Its implementation requires careful consideration and must be paired with effective teaching techniques, sufficient resources, and a thorough comprehension of the local environment. To make sure that the technology is genuinely in line with their needs and ideals, it is equally essential that communities, parents, and students take an active part (Traxler & Vosloo, 2023; McGrath et al., 2021). The COVID-19 pandemic's severe effects, which compelled many educational institutions to switch to online instruction, add to the urgency. This circumstance emphasizes how crucial technical preparedness and flexibility are to the educational process. In addition to long-term efforts to enhance educational inclusion through technology, this research will offer a greater knowledge of how technology can be optimized in emergency situations. Consequently, this research is not only relevant to the current situation but also important for future planning to establish an inclusive and resilient learning environment. Technology has the ability to transform inclusive education by enhancing accessibility, customization, and engagement for a diverse student body, including those from disadvantaged backgrounds and those with disabilities. Tools including assistive technologies, digital platforms, and AI-driven customization have been shown to support educational equity and satisfy a range of learning needs. Access to technology alone, however, does not significantly improve learning results unless paired with inclusive practices and pedagogical support, according to data from global programs like OLPC.

The way that technology is used to meet each student's unique learning needs and promote meaningful engagement determines the educational impact; simply supplying devices is not enough. One of technology's greatest advantages is its ability to close socioeconomic and geographic divides, especially in places like Latin America and India where distant learning has benefited marginalized populations. Children with special needs are also assisted by it through screen readers, different input techniques, and adapted content. Technology-enabled remote learning proved useful in emergency scenarios by ensuring continuity during the COVID-19 epidemic. Nonetheless, notable challenges persist, including the digital divide, insufficient teacher preparation, concerns around data privacy,

and uneven policy implementation. In the absence of comprehensive, ethical, and situation-specific solutions, these issues could make already-existing inequalities worse.

3. To Identify and Highlight Assistive Technologies for Inclusive Education

The Standard Rules on the Equalization of Opportunities for Persons with Disabilities were the first international regulations that incorporate assistive technology, and the Convention on the Rights of Persons with Disabilities (CRPD) solidified these regulations even further. Conventions should be directly relevant to individuals with a variety of impairments, including the elderly population, who may benefit from the use of assistive products. It is crucial to place assistive technology policy within the larger framework of international development in general as well as more specialized policy innovations. The 17 internationally agreed-upon Sustainable Development Goals will direct worldwide efforts in every nation to focus their development efforts in a way that guarantees "nobody is left behind." In accordance with recent research by Tebbutt et al., the SDGs show how the use of assistive technology at the population level can help achieve each of the 17 objectives. Assistive products can be conceived as both mediators of social change (i.e., as a mechanism social change works through) and as moderators of that change (as a factor that determines the extent of the change, particularly whether it reaches the more marginalized and vulnerable groups in society). Any equipment, program, or gadget that makes it easier for people with disabilities to complete tasks that would otherwise be challenging or impossible for them is referred to as assistive technology. With the help of these technologies, individuals with physical, sensory, cognitive, or communication disabilities will be able to live more freely and engage more completely in everyday activities.

Examples of assistive technology include:

- **Screen readers** for individuals who are blind or visually impaired, which translate text on a screen into speech.
- **Hearing aids** help enhance sound for those who are hard of hearing.
- **Wheelchairs** and **mobility scooters** to facilitate mobility.
- **Speech recognition software** to assist those who struggle with hand-eye coordination or typing.
- **Adaptive keyboards** and **switches** for persons with poor motor abilities.

These technologies, which range from basic tools to sophisticated gadgets, can be classified as either high-tech or low-tech. Through the Global Collaboration on Assistive Technology (GATE), the World Health Organization (WHO) formed a cooperative endeavor to keep assistive technology at the forefront of long-term, worldwide advancements. Policy initiatives should acknowledge and take into account the use of assistive technology in all sectors and for all age groups, rather than concentrating on its isolation. Policymakers are under a lot of pressure to provide both a fully integrated system that can provide at the population level (e.g., the Human Activity Assistive Technology Model or the Matching Person and Technology (MPT) Model) and specialized assistive technology that caters to the unique needs of individual users.

"Assistive technology" (abbreviated "AT") is a generic term that encompasses all systems and services related to the use of assistive goods and the provision of services, according to the World Health Organization (WHO)."Any item, part of equipment or system, whether taken over commercially, modified, or tailored, that is commonly used to increase, maintain, or improve the practical abilities of people with disabilities" is the definition of assistive technology in the United States (Buning et al, 2004, p. 98). The Assistive Technology Act of

1999 served as the foundation for this definition. According to Lewis (1993), one of AT's two primary goals is to assist individuals in becoming more capable so that their abilities balance out the consequences of any constraints.

To compensate for limitations, the second step is to provide an alternative method of completing a task. The two categories of assistive technology (AT) are low technologies, such as pencil holding devices and magnifiers, which do not require programming, and high technologies, such as computers, which do (McColloch, 2004). Both Bryant & Crews (1998) and Cook and Hussey (1995) have distinguished between two types of AT: low-tech, or basic technology, and high-tech, or complex technology. It is usually cheap and easy to get or make low- or simple-technology equipment. Pencils, calculator loupes, paper communication boards, wheelchairs, and other tools must be used more simply. Devices having electronic components, such as computers, electronic communication boards, electric wheelchairs, etc., are considered complex technology.

Objectives

1. To explore and understand the concept of inclusivity in education.
2. To examine the role of Information and Communication Technology (ICT) in promoting inclusive education.
3. To identify and highlight various assistive technologies that support inclusive education.
4. To explore adaptive and emerging technologies for enhancing inclusivity in classrooms.
5. To analyse current challenges and obstacles in the use of ICT for inclusive education.
6. To anticipate and analyse future trends in inclusive education with respect to technological advancements.

Over-Reliance on Maritime Technology

1. The Two-Sided Blade of Technological Development

Technologies like radar, VHF, and ECDIS (Electronic Chart Display and Information System) have undoubtedly revolutionized marine navigation by improving accuracy, situational awareness, and overall safety. Tools such as the Automatic Identification System (AIS) and the Voyage Data Recorder (VDR) enhance data tracking and logging. However, the purpose of this technology was to support mariners, not to replace their knowledge or discernment. The primary irony here is that technology may inadvertently promote complacency among OOWs in spite of its best attempts to increase safety. As previously stated, measures and technologies aimed at improving marine safety may ironically have the opposite effect of making people less watchful.

2. Loss of Traditional Navigational Skills

The chapter highlights the deterioration of both terrestrial and celestial navigation skills as a key issue. Capabilities like visual pilotage, astronomical fixes, dead reckoning, and chart interpretation on paper are crucial backups in case electronic systems crash. These basic abilities atrophy in the absence of constant practice. When there are electronic problems, cyber-attacks, or system outages, this is very dangerous. Furthermore, because there are more than 30 manufacturers, limited training and inexperience with certain ECDIS models

enhance operating dangers. Lack of familiarity with the logic and layout of the system might lead to mistakes even for experienced mariners.

3. Case Studies – Real-World Failures of Over-Reliance

- The cited cases highlight practical implications:
  - MAIB Case 3: "Grounding on the green bit" (2018): The OOW trusted the planned path without questioning that it passed through shallow water by relying too much on the ECDIS. The lack of cross-checking with radar or visual cues, which is a fundamental aspect of effective seamanship, led to the grounding.
  - MAIB Case 2: "Alarm Bells" (2018): The OOW was not aware of the current threat since the alarm system was turned off. This illustrates the inefficiency of even operational systems due to inadequate ECDIS settings management.

- The tragic M/T Sancho Collision (2018) case revealed problems with data integrity. The real navigation parameters (20–25° variation in COG and 2-3 knots in SOG) were significantly different from the AIS-transmitted data. These disparities could be the result of configuration mistakes, system flaws, or even manipulation, underscoring the necessity of cross-checking with several sources.
  - Grounding Ovitz (2013): By neglecting to modify the default safety settings and failing to recognize threats such as Verne Bank, the officer "planned" grounding. A total collapse of fundamental navigational control occurred when neither the master nor the OOW examined the passage plan.

- MAIB Report Case 9 (1999): Although the radar was set up appropriately, it was misinterpreted because of the Head-Up display, which resulted in incorrect assumptions. This illustrates how even technically sound technology can be flawed if not properly perceived.

4. Human Error + Technology = Systemic Vulnerability

A common element in many of these tales is that failure was caused by human interaction with technology rather than by technology in se. Whether the cause is a lack of verification, improper scale selection, default settings, or insufficient training, human error is always a significant role. The Swiss Cheese Model of accident causation, which holds that an incident occurs when flaws in multiple protection layers (technology, protocols, and training) coincide, is in accord with this. Human awareness and backup are crucial defences because technology is only one piece.

5. Implications for Training and Policy

Standardized, recurring ECDIS training for every individual model utilized on board is urgently needed, according to the report. Cross-checking procedures that use paper charts, radar, and visual bearings are required.

- Training and on board exercises provide a strong emphasis on the fundamentals of navigation.
- Strict passage planning review protocols, which include pre-departure inspections by the OOW and the master.

Raising awareness of cyber security is also necessary. The increasing digitization of systems like ECDIS and AIS makes them vulnerable to spoofing and hacking.

The experience made it abundantly evident how dangerous it is to depend too heavily on data from a single device and how important it is to use data properly in order to avoid collisions. Our preliminary analysis indicates that fatigue is one of the main reasons for marine mishaps. Fatigue build-up can be caused by a number of circumstances. Zhang, Hu, and Chen (2019) argue that human-organizational elements in harbour pilotage risk are linked to fatigue. Short-term fatigue can affect judgment and situational awareness and is primarily caused by long workdays and high levels of stress (Oldenburg, Jensen, Alatza, & Bauru, 2009). A prolonged absence from friends and family can lead to chronic fatigue, which can depress spirits. Complacency with the work can also result, which makes it easier to miss important signs of a potential disaster. This study (Defreeze, 2018) looks at possible remedies for police officers who are suffering from alarm fatigue while on the bridge. Furthermore, certain of these systems might deceive the operator and fail to warn them of the risks (Jacobson & Lutz€ oft, 2008; Lutz€ oft, 2004). “Gaining a deeper understanding of the tools being utilized and being able to quickly determine what each alarm means can improve situational awareness. In conclusion, it seems that every book the writers have examined has in some way addressed human error. The main cause of marine incidents is typically human error. To discover a solution, the causes must be identified. Examining human error reveals three important elements. These include over-reliance on technology, fatigue, and training. These three components are interconnected rather than existing alone. Examining how officers use technology and how it both helps and hinders the bridge watch is also essential for the research from this literature review. Numerous sources mentioned above make it abundantly evident that many police officers are either unaware of the technology being employed or have grown accustomed to keeping a close eye on these systems all day and night. It is possible to make a thorough research and offer practical solutions for pressing problems by focusing on a limited number of important contemporary technologies.

4: **To explore adaptive and emerging technologies for enhancing inclusivity in classrooms**.

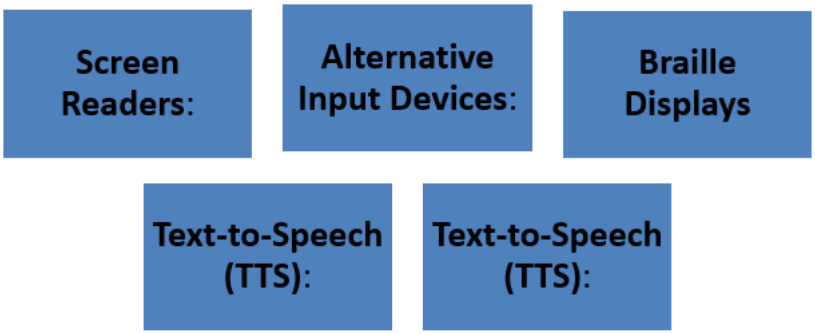
Emerging and technologies that adapt are revolutionizing inclusive education by offering innovative approaches to accommodate a range of learning preferences, prerequisites, and skills. For students who need extra support or have disabilities, these tools can make learning more accessible. Some significant adaptive and innovative technologies that are influencing inclusive education are listed below:

1. Assistive Technologies (AT)

These resources are designed to help students with disabilities participate more actively in the educational process and to make it easier for them to attend school. According to Funk (2012), assistive technology can be a powerful tool for increasing independence and engagement provided it is appropriate for the user and their environment. As per the International Classification of Functioning, Disability, and Health (ICF), assistive technology is a general word that encompasses any equipment, gadget, device, or technology that is expressly designed or altered to improve the functioning of individuals with disabilities (Ellis, 2016). There are several types of assistive technology to consider when choosing a device. This category may include both low-tech and high-tech items. "Inexpensive devices that are simple to make and easy to obtain," as Cook and Polar (2008) put it, are low-tech devices (p. 6).

Examples include customized eating utensils, whiteboards, head pointers, and interaction using visuals. Another category of devices that emphasize non-technological strategies is that of Glenna and Decocted (1997). According to their research, "low tech strategies use basic equipment, high tech strategies use more complex, typically computerized equipment, and no tech strategies involve any equipment." (Page 379).

Approximately one billion people globally, according to World Health Organization (WHO) projections from 2017. Mostly for the elderly and others with disabilities, the globe requires one or more assistive technology products. Due to aging populations and a rise in non-communicable diseases, it is projected that the global population will surpass two billion people by 2050 (WHO, 2017).



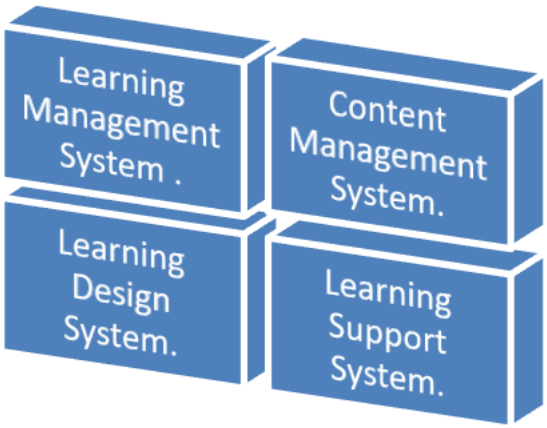
- **Screen Readers**: For the students with visual impairments, software such as JAWS, NVDA, and Voiceover reads the text on a screen aloud.
- **Text-to-Speech (TTS)**: Converts written text into spoken words, helping students with dyslexia or reading difficulties.
- **Text-to-Speech (TTS)**: Programs like Dragon NaturallySpeaking or Google Voice Typing allow students to dictate text, supporting students with physical disabilities or writing challenges.
- **Braille Displays**: These devices enable students with visual impairments to read digital text in Braille. Various writing devices of Braille are as *Interline Braille Frame, Taylor Postcard Frame, Pocket Braille Frame, Styli, Braille Kit and Pragma Sketching Device* are the famous writing devices used by the children with visual disability.
    1. **Interline Braille Frame:** is used for writing standard character interline Braille. The frame comprises a wooden board, a metal, a reversible paper clamp and a stylus.
    2. **Taylor Postcard Frame:** is used for writing small character Braille on one side of the paper.
    3. **Pocket Braille Frame:** is a four-line pocket Braille frame that produces small character Braille on one side of the Braille paper. This is specially used for making small and occasional notes.
    4. **Styli:** are produced with handles of various shapes to suit individual needs. They are made of stainless steel and handles are polished hardwood or synthetic material. It enables a child with visual disability as well as one with low vision to create simple sketches and diagrams out of a thread. It is based on the principle of using acrylic thread as “writing ink” and nylon fabric fastener strips as a “writing slate”.

Braille paper	the braille paper is used for embossing braille dots on it. The standard size of Braille paper is 22''X 28' and weight 8.6 kh .

- **Alternative Input Devices**: Devices like eye-tracking systems, adaptive keyboards, or switch controls can assist students with mobility or motor impairments in interacting with computers.

2. Learning Management Systems (LMS) and Personalized Learning Platforms

The Learning Management System or popularly known as LMS in the community of higher institutions is an online portal that connects lecturers and students. It provides an avenue for classroom materials or activities to be shared easily. In line with the ever-changing modern times where students rely on the internet for most of their daily activities, it is appropriate for an online system or student portal to be set up to cater to their academic needs. The online portal has to be a place where students can confidently search and obtain information regarding their courses, and also to ensure the accuracy and reliability of the information. The Learning Management System (LMS) is one such system which is used by various universities all over the globe. There are basically four types of e-learning systems: the Learning Management System (LMS), Learning Content Management System (LCMS), Learning Design System (LDS), and Learning Support System (LSS).



Meanwhile, the LMS is also known in various universities as Virtual Learning Environment or Course Management System. Ayub, Rohani, &Wan Marzukiet., etal defined LMS as a web-based technology which assists in the planning, distribution and evaluation of a specific learning process. It is a software environment designed to manage user learning interventions as well as deliver learning content and resources to students. LMS can also refer to an application that is used for tracking, managing learning and administrating system, and is especially used in a learning environment. Meanwhile, it has been stated that the LMS is "a set of tools and a framework that allows the relatively easy creation of online course content and the subsequent teaching and management of that course including various interactions with students taking the course" (as cited in Mas Nida et al.).

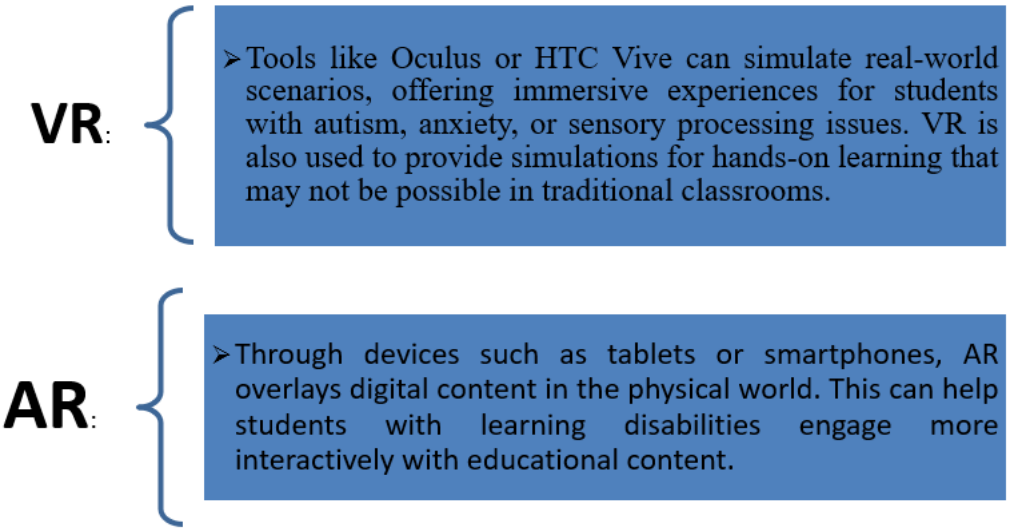
These systems use data-driven approaches to tailor learning experiences to the individual needs of each student.

- **Google Classroom and Microsoft Teams**: Platforms for sharing resources, providing feedback, and communication among students and teachers, with built-in accessibility features like closed captioning and screen reader compatibility.

- **Personalized Learning Tools**: Software like DreamBox or Khan Academy adapts content in real time based on student performance, offering personalized learning pathways.

3. Augmented Reality (AR) and Virtual Reality (VR)

AR and VR create immersive learning environments that can help engage students with different learning styles and disabilities.



4. Artificial Intelligence (AI) and Machine Learning (ML)

AI and ML algorithms can provide real-time support and adaptive learning experiences tailored to each student's needs.

- **AI Tutors**: Tools like Squirrel AI and Carnegie Learning provide personalized tutoring experiences, adjusting to the pace and learning style of each student.
- **Speech and Language Processing**: AI-driven speech recognition and language processing can help students with speech impairments or language delays by providing speech therapy tools or communication support.

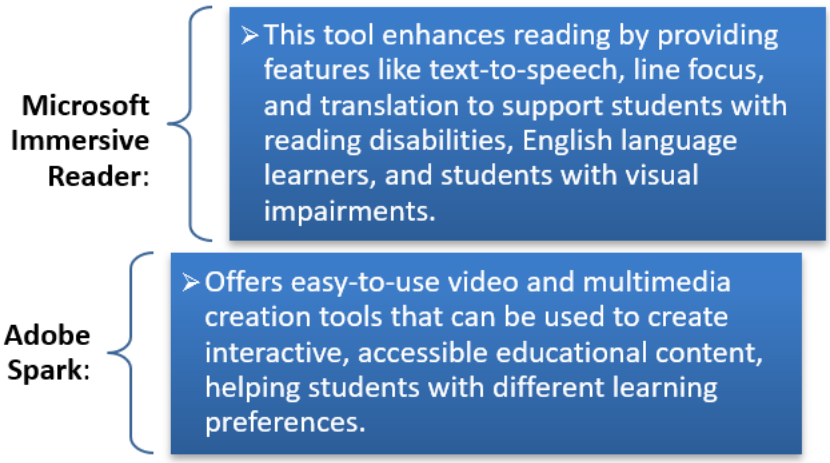
5. Interactive Whiteboards and Smartboards

These digital boards, like SMART Boards or Promethean boards, support multi-sensory learning through visual, auditory, and tactile interactions, which are especially beneficial for students with different learning needs.

- **Touch-Based Interaction**: Allows students with limited mobility to engage with content in a more hands-on, intuitive way.

6. Accessible Content Creation Tools

Tools that help teachers create more accessible learning materials for students with diverse needs:



7. Gamification and Educational Games

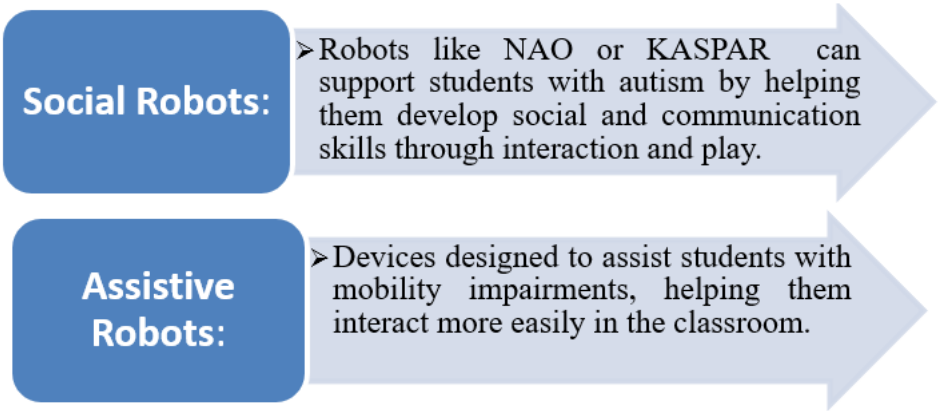
- **Games for Cognitive Development**: Interactive games and simulations can provide cognitive and motor skill development, and engage students in ways that traditional methods might not.
- **Adaptive Learning Games**: These include games that adapt the level of difficulty according to the learner's abilities, making it more accessible for students with disabilities.

8. Real-Time Captioning and Translation Tools

- **Automatic Speech Recognition (ASR)**: Tools like Google Meet's live captions or Microsoft's real-time captions provide real-time transcription, helping students with hearing impairments follow along in class discussions.
- **Translation Software**: Tools like Google Translate or iTranslate can help students who are English language learners or those with specific learning challenges such as dyslexia or auditory processing disorders.

9. Robotics and AI in Special Education

NAO and KASPAR are both names of humanoid robots, and each one has its own unique background:



- **NAO:** This robot's name doesn't have a specific acronymic meaning, but it is derived from the word "Nao" in Japanese, which means "to live" or "life." NAO is a programmable humanoid robot developed by SoftBank Robotics, used primarily for education, research, and entertainment.

- **KASPAR:** This robot's name stands for "Kinesic Animated Social Partner". KASPAR is a robot designed to assist in therapy, especially for children with autism, helping them improve social interaction skills.

10. Cloud-Based Collaboration Tools

- Tools like **Google Docs** or **Padlet** allow students to collaborate on projects and assignments in real time, enabling students with different abilities to contribute in flexible ways.
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5. To analyse current challenges and obstacles in the use of ICT for inclusive education.

ICT has been demonstrated to be helpful in inclusive education, but a variety of barriers keep its widespread use. In developing countries, where access to computers, the internet, and assistive technology is still limited, inadequate infrastructure is a significant problem (UNESCO, 2017). Mooij (2013) asserts that the expense of acquiring specialized ICT tools and continuing technical support may potentially place a financial strain on schools. Another difficulty is that educators and administrators might not be aware of the potential advantages of ICT or might be unwilling to integrate new technology into their class plans (Thomas, 2014). schools, even if the value of ICT is becoming more widely acknowledged (Fitzgerald, 2014).

Together, governments and educational institutions must draft laws that enable equitable access to ICT resources and allocate enough money for supply, training, and support. Because technology facilitates cooperation, provides individualized learning experiences, and enhances accessibility, ICT is essential for bridging the gaps for kids with special needs. ICT has the potential to revolutionize inclusive education, despite ongoing issues with training, infrastructure, and legislation. To guarantee that children with special needs have an equal chance to thrive in an inclusive learning environment, future investments in teacher preparation, policy creation, and technological resources will be required.

ICT has the potential to significantly improve inclusive education, but some basic barriers stand in the way of its successful implementation, especially in developing countries. In many schools, people still have limited access to computers, internet connectivity, and assistive technologies, making poor infrastructure one of the most pressing issues (UNESCO, 2017). In addition to infrastructure, financial constraints provide significant difficulties. According to Mooij (2013), schools usually lack the funding required to buy and maintain specialist ICT equipment or provide ongoing technical support. These budgetary limitations make it difficult to prioritize technology, particularly given the ongoing scarcity of essential teaching resources.

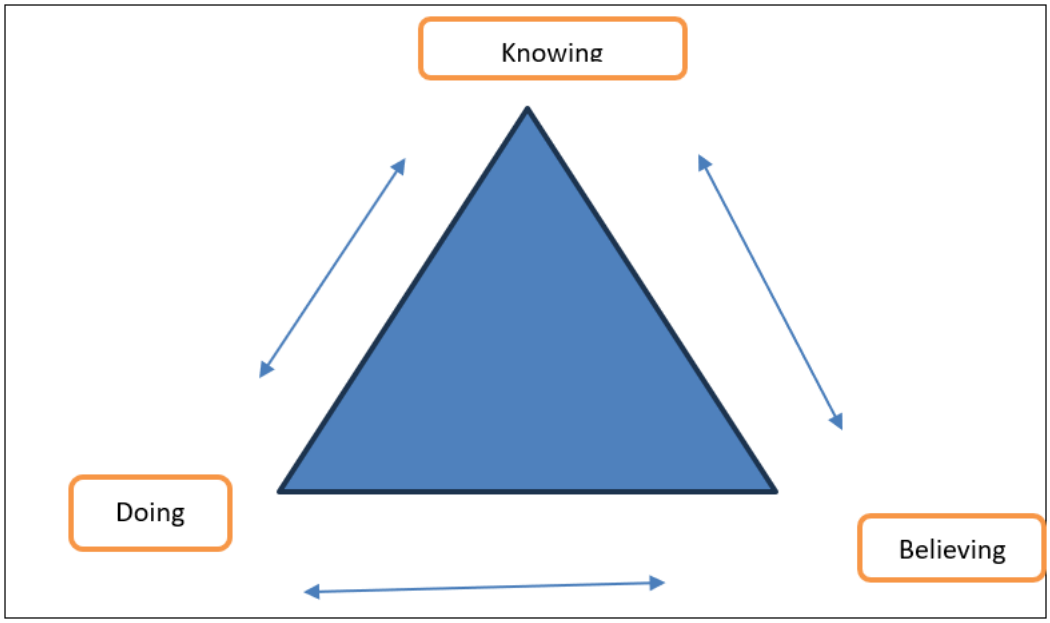
Another important problem is the ignorance and unpreparedness of educators. Because they lack the requisite digital skills or are averse to change, many educators and school administrators are either unaware of the benefits of ICT for inclusive education or are hesitant to implement it in their classrooms (Thomas, 2014). Even though more people are realizing how important ICT is (Fitzgerald, 2014), progress is still impeded by a lack of proper training and support. Governance and policy limitations also affect ICT integration. Without strong laws, enough funding, and strategic planning, ICT is still underutilized in inclusive education. Governments and institutions fail to take a coordinated approach, which leads to inconsistent execution and little long-term impact. Despite these challenges, there is still a lot of promise in ICT. For children with varying needs, it makes learning more accessible, promotes teamwork, and makes learning more personalized. However, a

comprehensive strategy that includes financing for ongoing support networks, inclusive policymaking, infrastructure, and teacher training is needed to realize its full potential.

6. To anticipate and analyse future trends in inclusive education with respect to technological advancements.

The notion of "inclusive education" represents a dilemma in terms of universalization and particularization of the educational experience for all children. This notion, and dilemma, also translates into the international space, with "inclusive education" situated within the international human rights agenda in places such as the Convention on the Rights of Persons with Disabilities and the Sustainable Development Goals. Despite its prominence as a universal human rights topic, inclusive education is also a deeply and richly contextualized, localized, and relational phenomenon. In this chapter, the authors aim to explore current trends in research and practice of inclusive education from a comparative and international perspective, and offer some potential future directions for research and practice on inclusive education. the future of inclusive education is heavily influenced by technological innovation, personalized learning approaches, and an increasing recognition of the importance of social and emotional well-being. As these trends unfold, they hold the potential to transform education into a more flexible, accessible, and equitable system, supporting the diverse needs of all students. However, addressing challenges such as equity in access, teacher training, and technological infrastructure will be crucial to ensuring that these trends benefit every student, regardless of background or ability.

One of the many difficulties associated with ensuring educational equity in the creation of 'schools for all' concerns the preparation of teachers to meet the challenges of social and educational inclusion in increasingly diverse societies. Rouse (2008) has suggested that the challenge of professional development might be expressed as a reciprocal triangular relationship between three elements,



Knowing, believing and doing

In this model, any two of the three elements of knowing, believing and doing are thought to influence the third. This means that if, as is often the case, a teacher believes in the rights-based philosophy of inclusion and is willing to try it out by including learners who might

otherwise have been excluded, then the teacher's knowledge about inclusive practice will develop. Likewise, another teacher who believes in the principle of inclusion may lack confidence in 'doing', but by taking a course about inclusive practice develops the knowledge that gives him or her the confidence to engage in inclusive practice. Other teachers may know about inclusive practice but still be unsure about whether they believe in it, but by working in a school that has an inclusive ethos ('doing'), they come to see that the practice can be effective. These examples show that one does not have to wait for all of the elements to be in place – teachers will be in different places in terms of their knowledge, beliefs and practices. Therefore, the important question is how teachers can be supported to develop the knowledge, beliefs and practices that support inclusion.

Thirty-five years ago, when this journal, then entitled *Special Education: Forward Trends*, was launched, the Government was about to embark on a landmark enquiry, chaired by Mary Warnock, into the education of 'handicapped children'. A few years earlier, the responsibility for children who remained excluded from education, then described as severely educationally sub-normal, was transferred from health to education authorities. A cursory look at the early issues of the journal reveals excitement and hope about the educational possibilities that would now be available to every child. Thirty-five years ago, special education was seen more as a 'solution to' rather than a 'problem of' social justice in education, but not for everyone and not for long. Sociological critiques of special education (such as Tomlinson, 1982) showed the injustices that can occur in systems with separate forms of provision for learners who deviate from what is considered to be the norm. Historians and other scholars began to write about the paradox of special education being something that fulfilled both humanitarian and controlling aims of society (for example, Cole, 1989; Lazerson, 1983).

Affordances of learning technologies

Though it has multiple connotations, the term "affordance" is commonly used in educational technology circles (Hartson, 2003; McGrenere and Ho, 2000; Oliver, 2005). "Affordance" signifies "what it offers the animal, what it provides or furnishes, whether for good or ill." James Gibson coined the phrase in 1979. It implies that the animal and its surroundings have a harmonious interaction. Gibson, p. 127, italics. "Affordance" only occurs if the individual (or animal) can carry out the acts required to utilize it, according to Gibson. For instance, whether or not someone realizes it, a mailbox is a "letter-mailing-with-able" item. According to Donald Norman, the second widely acknowledged proponent of the term "affordances," an affordance is a design element that specifies how an object should be used. What is meant by "affordance" are the thing's perceived and actual qualities, particularly the essential qualities that dictate how the thing might be used. Chairs allow people to sit because they offer support (Norman, 1988, p. 9). Norman's usage highlights the idea of "perceived" affordances, which states that an affordance is not useful to a potential user until it is perceived. Because perceived affordances affect the user's actions and, to a greater or lesser extent, how they are carried out, Norman (1988) contends that they are more important than an object's actual affordances. The study will use Norman's notion of affordances because it focuses on educators' perceptions of wearable technology's potential for teaching and learning. For results, teachers must see a potential use; if a use is present but unacknowledged, there is no educational value. The ability of the teacher to understand the demands of the learning environment and then choose and use technologies in a way that satisfies those needs is essential to the efficacy of employing technology for teaching and learning (John and Sutherland, 2005, Yoon et al., 2005). In order to creatively adapt educational technologies for use in the classroom, educators must assess the affordances and

limitations of these tools, as many of the ones now available were not developed with learning and teaching in mind (Mishra & Koehler, 2006). The analytical techniques used by educational designers become more adaptable to new developments in technology by focusing on the affordances that underpin the technologies. Because technology is evolving so rapidly, we need to shift our focus from merely understanding specific technologies to being able to assess the educational usefulness of new tools based on their capabilities (Mishra & Koehler, 2006). Instead of relying just on intuition or a lack of reasoning, it enables the selection of technology based on clearly stated learning goals.

CONCLUSION

Technology's capacity to make education more accessible, interesting, and individualized makes it important for establishing inclusive classrooms. Technology plays an important role in guaranteeing that every student, regardless of background, aptitude, or circumstance, has the chance to achieve by offering resources that support diverse learners and facilitating equitable access to learning opportunities. Technology acts as a bridge in an inclusive classroom, bringing students and teachers together as well as the wider world of information in ways that foster learning, comprehension, and success. Technology has become a potent instrument for promoting diversity in the classroom, removing obstacles to education, and guaranteeing that every student has fair access to education. Teachers may accommodate disabilities, meet a variety of learning requirements, and create interesting, customized lessons by utilizing cutting-edge technologies. Important developments include collaborative digital tools, adaptable learning platforms, and assistive technologies allow students of different capacities to engage in meaningful and active classroom participation. Additionally, technology encourages adaptability in teaching methods, allowing teachers to modify their methods to accommodate various socioeconomic and cultural situations, learning styles, and backgrounds. Despite the enormous potential of technology, its successful application necessitates a supportive infrastructure, teacher preparation, and fair resource distribution. Making the most of technology in inclusive education requires addressing issues like the digital divide and making sure instructional resources have inclusive designs. In summary, technology can create truly inclusive classrooms and is more than just an adjunct to conventional teaching techniques. Technology can empower all students, remove obstacles to education, and help create a more just and inclusive society if it is purposefully integrated and equitably applied. Emerging technologies in inclusive education aim to bridge gaps, ensuring that all students, regardless of their abilities, have access to meaningful and equitable learning experiences. By integrating these tools and technologies into classrooms, educators can cater to the diverse needs of learners, helping them thrive academically, socially, and emotionally.

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