AI and Inclusive Education: Opportunities and Challenges

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ABSTRACT

Artificial intelligence (AI), seen as a technology with the ability to perform complex tasks similar to the human brain, is emerging as a transformative tool in the field of education. It has opened new doors for learning and is making digital learning more comprehensive and excellent. AI is seen as having the potential to make learning more accessible and effective and to make it more inclusive by overcoming various learning barriers. Inclusive education, which provides equal educational opportunities to students regardless of their socio-economic status, language abilities, or disabilities, can be made more effective and widespread through AI.

In inclusive education, AI helps make education more student-centric, removes various learning barriers such as language barriers, and provides adequate support to meet the needs of students with disabilities. This ensures that all students can receive a quality education. However, while AI is significantly impacting inclusive education, some challenges remain, such as students' insufficient access to digital facilities, a lack of basic infrastructure, inadequate teacher training, and concerns related to ethics and privacy. This research paper examines the role and opportunities of AI in education to make it more inclusive. It also identifies and investigates the challenges facing AI in inclusive education.

Keywords: *Artificial Intelligence, Inclusive Education, Children with disability, Personalized Learning, Linguistic Diversity, Assistive Technology.*

Introduction

Technology has had a transformative effect on all aspects of our society globally, and education has been significantly impacted. Before COVID-19, the use of technology in education was limited, and education was mainly based on "chalk and talk". However, the increased use of technology after COVID-19 has dramatically transformed education. As the influence of technology continues to grow, it has profoundly changed education. In this context, AI has emerged as a new concept in technology. Although the term was first used by John McCarthy in 1955, and the concept involved creating machines that could perform like human cognitive abilities (Schwendic et al., 2020). However, it was not widely used at that time. Currently, AI has brought a new discourse in the field of education, how effective is it from an educational perspective? How can it enhance the effectiveness of inclusive education?

AI is emerging as a revolution that is affecting various aspects of human life. Klaus Schwab, Executive Chairman of the World Economic Forum, referred to it as the "Fourth Industrial Revolution" or "Industry 4.0", which indicates a significant global shift. AI is an emerging technology that gives computer systems and machines the ability to display human-like intelligence. It includes fields like machine learning, natural language processing, and robotics. Essentially, AI has the ability to perform tasks that require human intelligence. It focuses on making machines as intelligent as humans and gives them the ability to perform cognitive tasks. Thus, it can be defined as a human intellectual process. AI is programmed with algorithms that allow machines to reason, solve problems based on experience, make decisions, and prepare various tasks like research papers and speeches. According to Ellen Glover (2025), AI is a broad branch of computer science that deals with the creation of smart machines capable of performing tasks that typically require human intelligence.

Education is a crucial pillar for individual and social development. The right to education is recognized as a fundamental human right (United Nations, 1948), but access to quality education is not equally available to all (Oluwaseyi Aina Opesemowo, 2024). Everyone faces various challenges in accessing quality education. For example, marginalized and disadvantaged communities often face significant barriers such as inadequate resources, inadequate infrastructure, and socio-economic factors that hinder educational achievement.

Inclusive education plays a vital role in fulfilling the constitutional goal of providing equal education to all. It creates an educational environment that provides equal opportunities for all students, regardless of factors such as disability, socio-economic background, religion, caste, or gender. This type of education attempts to remove institutional and socio-economic barriers that prevent students from participating in various societal activities and develops their abilities to increase their participation. Thus, it promotes the spirit of coexistence by eliminating socio-economic discrimination. Inclusive education was initially started to include students with disabilities in the mainstream. But now, it includes children from various socio-economic backgrounds, linguistic diversities, and marginalized groups so that those deprived of education can be included in the mainstream and become active members of society. This system opens the door to equality and justice. UNESCO (2020) defines inclusive education as an educational approach that integrates all learners into mainstream classrooms despite physical, cognitive, or social-emotional differences.

Children under the age of 18 years constitute about 30 percent of the total global population. A large portion of these children are economically, socially, and marginalized. The social inclusion of this large population is crucial for the inclusive development of society. The efforts of global bodies like the United Nations (UN) to meet the needs of socially excluded children led to the creation of the Sustainable Development Goals (SDGs) in 2015, which provided a universal framework for development efforts until 2030. Specifically, fourth aims of SDG to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". However, the COVID-19 pandemic has dealt a severe blow to the progress made toward the SDGs (Hanna, J. et al., 2024), the effects of which can also be seen in the education of children with disabilities.

Socially disadvantaged and disabled children face many challenges. The biggest challenge they face is society's negative attitude toward them. According to Sharma et al. (2023), a negative attitude in society causes persons with disabilities to face barriers to active participation in society. These barriers can be classified as external and internal barriers. External barriers include inaccessible transportation, lack of access to various public institutions, the attitudes of society and peers, and physical and social environmental barriers. Internal barriers include a child's health status, the type of disability, and behavioral barriers. Additionally, gender bias and inequality are also significant factors. Moreover, social games are very difficult for these children, and there is a lack of interaction, conversation, and social contact among children. In addition, educational access in the traditional classroom system remains a significant challenge, especially in areas where resources are limited. Despite adequate development in inclusive education today, it is still far behind its goals. A lack of basic infrastructure, a shortage of trained teachers, a lack of medical assistance, and the socio-economic status of parents are some of the reasons for which there is still a long way to go. Addressing the above issues, this paper proposes to examine the role of AI in facilitating the social inclusion of children with disabilities.

The Role of AI in Inclusive Education

One of the main uses of AI in relation to children with disabilities is that it can help identify and assess disability in children at an early stage. It can analyze data related to the behavior and health of specific children and create a profile for them. Additionally, AI can accelerate the development of personalized learning programs. These children often fall behind in education due to the unavailability of trained teachers. AI-based programs play a supplementary role for teachers in the education of children with disabilities and can create personalized learning strategies to meet their special needs.

New technologies using AI can also be developed to facilitate social interaction and communication for children with disabilities. AI can facilitate social interaction by creating a virtual environment that simulates real-world scenarios. This can help children with disabilities understand the social world around them and develop relationships and attachments with social institutions like individuals and groups. AI-enhanced virtual reality can create scenarios where users can interact with characters in a story, identify emotions, and help understand others' perspectives.

Personalized Learning

Personalized learning is teaching done at an individual level, keeping in mind the needs, abilities, and learning styles of the students. In an inclusive classroom, students learn at different paces and with different abilities, so their teaching can be made more successful if it is personalized. Imamah et al. (2024) compared the effect of personalized learning with traditional e-learning and found that while traditional e-learning improved students' performance by only 54%, using personalized learning resulted in an impressive increase of 71%. This allows students to be free to choose their own learning path, keeping their needs in mind. Personalized learning is an educational approach that customizes instruction to meet the needs and preferences of individual students (Adeleye, O. O. et al., 2024). Currently, most learning platforms use AI to

personalize the learning experience for each student based on their learning pace and experience (Premlata 2024). Through various AI-supported platforms, students can customize their lessons to their needs, abilities, and pace. These platforms can also present different activities, assist with homework, and make learning more interactive. Similarly, teachers can use AI in their lesson plans to customize lessons for specific children, track their performance, and evaluate them appropriately. For example, Google's Socratic app is an AI-supported application that simplifies complex concepts, makes learning accessible and interactive, guide students step-by-step, and helps with homework. In addition, various Chabot like ChatGPT, Co-pilot, Gemini, Claude, and Perplexity provide students with various information based on their needs and search queries, using natural language processing models.

Assistive Technologies and Tools

Under inclusive education, various assistive devices are being enhanced using AI to make learning easier and more personalized for students with disabilities. The role of AI in social inclusion can be seen as making assistive technology smarter. Various types of assistive technologies and tools can be made more helpful, more functional, and more useful with its help. These AI-based assistive technologies and tools, such as learning applications on touchpads, text-to-speech software for computers, picture boards, and speech devices, play a crucial role in including children with disabilities in traditional classrooms. These technologies help with language learning, increasing interaction with peers, and sharing experiences (Renuka Devi & Sarkar, 2019). According to Vedant Singh (2025), assistive technology helps improve the functionality and quality of life of people with disabilities. It gives them more independence, productivity, and quality.

AI-powered Educational Tools

Texas Tech University has provided a list of AI-based assistive tools, some of which are as follows:

- **For Physically Disabled Children**
  - **Robotics Exoskeletons:** Assist with mobility challenges such as walking, standing, and working. Examples include Trexo Robotics and CP Walker 2.0.
  - **AccessNow:** Helps in finding various transportation options and other related facilities for the disabled in public places.
  - **Avelity:** Provides guided navigation to find routes in large and complex places.
- **For Visually Impaired Children**
  - **Be My Eyes:** An image-to-text conversion chatbot based on the GPT language model.
  - **Seeing AI:** Assists the blind and partially sighted with various daily tasks like reading text material and identifying products.
  - **Brainy Brain:** Enables interaction with the computer with the help of voice commands.
  - **Kurzweil 3000:** Text-to-speech software that can read digital or printed text aloud.
- **For Hearing Impaired Children**
  - **Gno Sys and OrCam:** Can convert sign language into text or speech in real-time.

o **Live Transcribe:** Makes nearby sounds more accessible.

o **Paratront:** Assists with conversation for those with unusual speech patterns.

o **Voiceitt:** For people with speech disabilities and articulation problems.

o **RoserVoice Call Caption Solution:** Allows conversations to be read on a mobile phone.

Linguistic Inclusion

In today's globalized world, diverse languages are seen as a barrier to communication. In a multilingual country like India, where every state and region has its own linguistic characteristics, a lot of diversity is seen. The constitution includes 22 languages in the Eighth Schedule. Additionally, many regional languages and dialects are in use. As English has established itself as a global language and for employment, various AI tools can be useful in promoting linguistic inclusion and reducing linguistic conflicts. These tools use technologies like machine learning, deep learning, and natural language processing (NLP). NLP is based on language data and responds by understanding various languages. According to Anju E. S. and Manoj Kumar K. V. (2014), it works based on how humans understand and use language. NLP continues to update itself based on its responses to language. According to Ricardo Fitas (2025), NLP innovations have led to the development of many types of multilingual-supported tools, such as GPT-based systems. He identifies four main types of translation tools in the classroom:

* **Machine based translation:** tools like Google Translate, Microsoft Translator, Bhashini, and Anuvadini.

* **Real-time translation:** tools like Wordly and Sp.fio.

* **AI-based language bots:** like Duolingo.

* **Bilingual content generators:** which can create educational content in multiple languages, such as DeepL Translator, Rosetta Stone, and Babel.

Real-time translation of original language into a corresponding language through captions in text and video, or as audio, can be helpful for students from diverse linguistic backgrounds as well as for hearing-impaired students. Tools like Google Translate help with language translation, using techniques like natural machine translation. AI not only makes language learning more personal and accessible but also helps students integrate different languages and provides various linguistic options.

Adaptive Assessment

Proper assessment is necessary for students' meaningful learning, providing them with appropriate guidance in the face of increasing competition, and maintaining their self-confidence. Currently, AI can help with students' proper assessment. Manish Mohta (2024), writing in the Hindustan Times, states that integrating personalized assessment methods through AI can bring a potential change to the education sector.

In inclusive education, students come from diverse educational, socio-economic backgrounds, and different intelligence quotients, which can lead to variations in learning. If they are assessed in the same way, proper results may not be obtained. AI helps identify the strengths and weaknesses of students' learning

and adapts the difficulties they face. According to Manish Mohta, "Adaptive assessment is a dynamic assessment technique that modifies questions based on the answers of the respondents".

AI identifies the learning patterns and tendencies of different children, which allows for adaptive changes in teaching strategies, methods, and study materials related to their learning, making the learning more effective for students.

Oluwaseyi Aina Opesemowo (2024), citing Alomayer, (2024) and Dures et al., (2024) writes that academic performance can be further improved by providing real-time feedback and personalized support through the use of AI, which motivates students to engage more in learning. According to Sudeshna Rana (2024), it can provide immediate and supportive feedback to students, helping them with self-assessment, introspection, and continuous development.

Behavioral and Emotional Support

AI can be helpful in providing behavioral and emotional support to children with special needs. According to Syed Faizan Ahmad et al. (2021), AI can recognize and analyze students' learning patterns. It helps analyze the performance of students' behavior, which can be used to predict students' behavior and solve their behavioral problems. By identifying the needs and abilities of the students, the teacher adjusts themselves accordingly. This means that teachers can adapt their teaching patterns to the students' learning patterns.

AI tools can be used to understand the speed of a student's response, hesitation in answering, and their level of confidence. According to Subramanian and Swati (2018), AI can be used to understand students' habits and create study plans accordingly. According to Farhana Mahjabin (2023), AI is providing personalized and scalable interventions that are tailored to the specific needs of students with disabilities. Various AI tools monitor behavior and provide related feedback, which can be used to create various strategies and plans related to emotional regulation for such students.

Challenges

Although AI helps students learn in a personalized and creative way, provides customized education for students with disabilities, and provides access to quality education in underprivileged and limited-access areas, it also faces many challenges.

Learning through AI becomes very mechanical. Students do not receive emotional support from machines. Children with disabilities or from underprivileged backgrounds, who lack adequate socialization, need social, emotional, and psychological support along with education. In their study, Ahmed Gokhan and Fatih Aydemir (2021) conclude that the widespread use of AI makes teaching extremely mechanical. Its use shows a lack of practical perspective in teaching, and ethical and security-related problems are also seen. Through AI, the educational aspect of students can be developed, but the development of other aspects is not possible. Poornapriya Gopinathan (2020) concludes in her literature review that students are already using mobile phones excessively, which is causing problems in their social and physical development. If they are educated through AI, this situation can become even more serious.

A challenge for AI is the security of user data. It is important to protect students' and teachers' data from cybercriminals and data leaks in the gray market. Also, the servers of most multinational companies are established in their home country, which means data can be accessed in other countries, increasing the possibility of its misuse in the future. Due to low digital literacy, many users do not understand how to use their data safely. According to Vedant Singh, some users are unaware of how data is collected and processed.

The purpose of education is to provide students with intuitive knowledge and to develop creativity in them. But due to students' excessive dependence on AI, their creativity is decreasing. A preliminary study led by Dr. Natalia Kosmina of MIT on individuals using ChatGPT concluded that excessive use of ChatGPT reduces the brain's working capacity by up to 55 percent. It significantly affects our cognitive perception. The use of AI reduces brain activity and adversely affects memory. A major obstacle to using AI in inclusive education is the lack of adequate AI training for teachers. No formal training has been arranged for teachers regarding AI, nor has the teacher training curriculum been updated.

Conclusion

Inclusive education is needed to provide access to education for special needs children and those in disadvantaged areas. The highly dispersed population of special needs children, the rising cost of education, and the lack of trained teachers make their education difficult. In such a situation, AI helps simplify the teaching process. Various AI-based educational tools and assistive materials based on different technologies can be helpful in the academic development of these children. Although challenges exist, they can be solved. If teachers are properly trained in AI and attention is paid to digital literacy, then AI related challenges can be overcome. According to Oluwaseyi Aina Opesemowo, we should pay careful attention to ethical considerations such as data privacy, algorithmic bias, and transparency to ensure the equitable development and implementation of AI technologies.

AI is nothing short of a boon for linguistic diversity and for children with different disabilities. The development and use of AI-based prosthetics and assistive devices can enable people with disabilities to live their lives like normal people. Marginalized communities often face significant obstacles, such as a lack of resources, poor infrastructure, and socio-economic issues that limit their opportunities. The progress of AI presents a transformative potential to address these inequalities and bridge the gap in education. Thus, this study, by understanding the role and challenges of AI in inclusive education, contributes to developing an effective education system that benefits all members of society.

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