

# Artificial Intelligence in Inclusive Educational Learning

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**Abstract**—Artificial intelligence has gained traction in the post-covid world. It is widely being preferred and used for the convenience it provides by offering customization and personalization. When applied in the field of education its use will prove to be beneficial for catering to the specific learning needs and pace for students. This paper makes a case for using artificial intelligence in the space of education, specifically for students with special needs and/or differing learning pace.

**Index Terms**—Artificial intelligence, inclusive learning, education, technology, individualized learning, acceptability, language translation, intelligent tutoring system

## I. INTRODUCTION

Artificial intelligence and machine learning have become essential drivers of growth across multiple industries, including education. Technology is helping to make inclusive learning a tangible reality. But what exactly is inclusive learning?

Students with disabilities, language challenges, cultural differences, and more can now be included in the same classrooms and taught alongside their peers, rather than being isolated or excluded due to a lack of common ground. Artificial intelligence is making significant progress in the education sector, helping to bridge the gap between students and educators.

According to a report by e-Learning Industry, nearly 50% of learning management platforms will be driven by AI within the next three years. The Covid-19 pandemic in 2020 accelerated the growth of online learning, with more schools, colleges, and educational institutions turning to technology for education delivery. As a result, the demand for AI/ML software applications has risen. Another survey found that 85% of educators believe AI technology will play a crucial role in the future of education.

### A. Inclusive Learning – A Concept

Social, political, and technological developments have highlighted a significant flaw in the education system: the lack of inclusivity. This issue has become increasingly evident and needs urgent attention. Fortunately, inclusive learning is gradually becoming a reality.

## II. WHAT IS INCLUSIVE LEARNING?

It's well-known that students have different learning styles and personalities. While some are confident, others may be more hesitant. Some students face learning or speech disabilities, while others may have physical impairments. Barriers such as language, comprehension, and socioeconomic status also make learning and competing difficult for some students. Neurodiverse (ND) and Special Educational Needs and Disabilities (SEND) students, in particular, struggle with traditional learning methods. Each of these students has unique needs that affect how they learn. This is why special schools were established for students with special needs. However, these schools also present challenges, as students are often marginalized, treated differently, or even bullied for not fitting in with societal norms.

Inclusive learning seeks to address these challenges by fostering an environment where students with diverse abilities can learn together in the same classroom, without sacrificing the quality of education. It strives to create a supportive and holistic setting where students with special needs can confidently learn alongside their peers, free from negative emotions. Inclusive learning takes personalized education to the next level by proactively designing lessons, activities, and materials that all students can engage with, before making adjustments to meet individual needs. Both approaches are equally essential for a truly inclusive learning experience.

#### A. Bridging the Gap

Inclusive learning is essential as it helps bridge the gap between students by addressing the differences that set them apart—such as region, society, values, and beliefs. It ensures that every student has the opportunity to succeed and demonstrate their potential. Rather than simply reacting to these differences, it creates an environment where all students can learn together, providing a common platform for everyone to grow and achieve.

#### B. Right to Education

Every individual has the right to education. Barriers such as lack of facilities or personal lies should not prevent students from receiving an education. Inclusive learning ensures that all students can exercise this right, especially in a world where marginalized communities have been overlooked for years. It creates an environment that meets their needs while also serving the majority.

#### C. Opportunity for All

AI in special education is about providing students with special needs the same opportunities as others to participate in social activities and succeed. By allowing students with intellectual and physical disabilities to prove their abilities, a more inclusive learning environment is created that promotes equality. Individualized learning focuses on areas where students with special needs can improve, helping them compete on an equal footing with others.

#### D. Equality in Education

Achieving equality in education is a crucial step toward achieving equality among people. The goal is to offer equal rights to students from all backgrounds and abilities, enabling them to succeed. Inclusive education changes existing norms by adopting a universal approach. For instance, teachers create course content that benefits all students, using multimedia like images, videos, and audio to design lessons that are accessible to everyone.

#### E. The Basis for an Inclusive Society

When children are taught inclusivity, they grow up to foster a more inclusive society. Emphasizing diversity and inclusivity helps students understand and respect differences. Inclusive classrooms prepare children to be assertive and empathetic, teaching them tolerance and openness to diversity. This mindset broadens their perspectives and reduces

prejudice, making them more accepting of differing views.

#### F. A Better World

As children grow up with an understanding of diversity, they contribute to a better world. Issues like racism, cultural appropriation, and religious hatred become less prevalent when inclusivity is ingrained from an early age. Although it may seem idealistic, fostering a compassionate and understanding new generation is possible, and inclusive classrooms play a pivotal role in shaping young minds in the right direction.

### III. BENEFITS OF INCLUSIVE LEARNING

Adopting inclusive learning strategies in schools brings numerous benefits to students, educators, parents, and society at large.

#### A. Openness to Change/Acceptance

Exposing children to various lifestyles, cultures, appearances, and limitations from an early age helps them accept diversity. Instead of adhering to rigid ideas of what is considered normal or beautiful, they learn that differences are not inherently wrong or bad. This promotes openness and acceptance of one another, preparing them to embrace change.

#### B. Diverse Perspectives

Inclusive classrooms encourage students to engage in discussions about how different people perceive events. For example, students from different backgrounds can share their experiences of cultural differences or past conflicts. This interaction broadens their understanding of diverse perspectives, such as seeing the US-Vietnam War from both American and Vietnamese viewpoints.

#### C. Greater Interaction

While special schools have provided some support, they can also isolate children from mainstream society. Without exposure to peers with special needs, students may develop prejudice or misunderstanding. Inclusive classrooms bring students together, allowing them to interact and learn from each other's experiences, rather than relying on stereotypes or secondhand information.

#### D. Positive Attitude

A unified approach fosters a positive attitude among all participants. Students who may lack confidence can discover their strengths and improve their self-worth. Peer interactions and collaborative learning

enhance academic performance and help students develop teamwork skills. These positive traits will benefit them in both their personal and professional lives.

#### IV. LITERATURE REVIEW

Smith et al., 2020; Johnson & Wang, 2021, investigated the various applications of artificial intelligence (AI) in enhancing personalized learning experiences within inclusive education. It examines studies that demonstrate how AI algorithms can adapt educational content and methods to meet the distinct needs of students.

The review based on studies of Brown & Jones, 2019; Chen et al., 2022, focuses on AI-powered assistive technologies, analyzing how natural language processing (NLP) and computer vision improve accessibility for students with disabilities. It synthesizes current research to explore the impact of these AI-driven tools on fostering more inclusive learning environments ( ).

Further, García-Saiz et al., 2021; Kim & Lee, 2022, explored the role of intelligent tutoring systems (ITS) in supporting inclusive education. It evaluates various studies that highlight how AI-enabled ITS create adaptive and interactive learning experiences, benefiting students with diverse learning needs and enhancing overall teaching effectiveness

Additionally, Muller et al., 2023; UNESCO, 2022 studies also addressed the ethical challenges of using AI in inclusive education, offering a detailed analysis of concerns such as data privacy, algorithmic bias, and the digital divide. By drawing on recent research, it provides a critical examination of the potential issues and the necessary considerations for the ethical application of AI.

#### V. OBJECTIVES

The following are some objectives have been drawn for this study.

- 1) To explore the role of AI in providing personalized learning experiences for students with diverse learning needs.
- 2) To investigate ethical considerations and challenges in integrating AI technologies in inclusive educational environments.

3) To identify best practices for implementing AI technologies in inclusive classrooms and their impact on student engagement and participation.

4) To examine the long-term implications of AI integration on social inclusion and equity in education.

#### VI. WHAT IS THE ROLE OF TECHNOLOGY IN INCLUSIVE EDUCATION?

Custom-made solutions are the only way to train students with special needs as the types of disabilities are too varied to create a one-for-all solution. The aim of using technology in inclusive learning is to reduce the feeling of dependence. The course is charted in a way to make students more independent and rely less on the educator. This makes them feel confident to tackle situations on their own. Moreover, students tend to know what they are good at and how they prefer to learn. Providing these options in the classrooms will make it easier for them to display their strengths.

A few examples of how technology can help in inclusive education are listed below:

i) Speech recognition technology makes it possible for students with special needs to record the lessons or convert handwritten text to speech.

Ii) Augmentative communication and speech therapy classes are conducted online to help kids with speaking disabilities compete with other students in the classroom.

Iii) AI-based translators assist students to bridge the gap between two or more languages. Students can learn in a language they understand.

Iv) Students can rely on web-based learning and online classes to overcome geographical and distance barriers.

v) Students who speak minority languages can use AI-based translation apps to understand the lessons in their native tongue.

vi) Students with visual disabilities can learn through text-to-speech conversions, while those with hearing difficulties can benefit from the visual representation (PPT, AR/ VR devices, etc.).

Artificial Intelligence (AI) is making significant contributions toward inclusive learning, helping ensure that education is accessible, personalized, and equitable for all learners, including those with disabilities, learning challenges, and from diverse

backgrounds. AI is playing a key role in addressing educational gaps and offering tools that enhance learning experiences. Here are some of the major ways AI contributes to making inclusive learning a reality:

## VII. HOW AI IS CONTRIBUTING TO INCLUSIVE LEARNING

### 1. Removes Bias

Human bias is an inherent part of our society. Artificial intelligence can help reduce and remove bias that comes in the way of the teacher-student relationship, especially when either of them belongs to different cultures, races, regions, etc. However, we need to ensure that the data fed into the AI systems are not biased.

### 2. Individualized Learning

AI eLearning platforms have been personalizing the content and the speed of training to suit the students. AI makes it easier for students with special needs to learn at their own pace without feeling stressed out. It can also convert the content into different formats suitable for each student.

### 3. Accessibility

Technology makes it possible for children from remote areas to access education which wasn't possible during the earlier days. Even if there are no schools/ colleges in the area, children can still continue their education through eLearning apps. For example, MOOC (Massive Open Online Course) is a model that delivers online content and learning opportunities to anyone who wants to learn irrespective of physical attendance.

### 4. Affordability

The advent of AI is gradually reducing the cost of education. Students can apply for online courses and certifications that are cost-effective and provide the same quality of education. This helps students from highly diverse backgrounds to have a chance at education. Those who cannot attend colleges and universities can also learn by joining online courses that cost less and fit their budget.

### 5. Teaching Techniques

Artificial intelligence is also helping teachers understand ways to teach students with special needs. AI in inclusive learning assists teachers to identify the right method of teaching and the right channel of communication to interact with a student

from a different background. The aim is to change how teachers perceive learning by making them proactive instead of reacting to the situation.

## VIII. KEY APPLICATION AREAS OF AI FOR INCLUSIVE LEARNING

AI has a significant impact on making education more inclusive and accessible for all learners, including those with disabilities or diverse learning needs. Here are some key applications:

### 1. Personalized Learning Paths

AI facilitates personalized learning experiences that cater to the unique needs of each student. By analysing data to identify a learner's strengths and weaknesses, AI can customize content, recommend suitable learning strategies, and adjust the learning pace. This is especially advantageous for students with special educational needs (SEN), as AI-driven systems can design individualized learning environments to address a variety of needs.

### 2. Support for Students with Disabilities

AI tools are crucial in supporting students with physical and cognitive disabilities. Some of the key AI-driven assistive technologies include:

**Speech Recognition and Text-to-Speech:** AI can help students with visual impairments by converting text into speech, making reading materials more accessible. For students with dyslexia, text-to-speech tools can assist in comprehension.

**Speech-to-Text:** Students with physical disabilities or motor impairments can use speech recognition technology to dictate their responses or create written content.

**AI-Powered Visual Aids:** AI tools can provide real-time visual recognition for students with hearing impairments, translating sign language into text or speech.

**Adaptive Learning Systems:** AI can provide interactive learning experiences that adjust in complexity to suit students with learning disabilities like ADHD or dyslexia.

### 3. Adaptive Assessments

AI can generate assessments that adapt in real-time according to a student's performance, ensuring the difficulty is suitable and offering instant feedback. Additionally, teachers no longer need to spend hours preparing tests and quizzes. Online assessment tools such as PrepAI can automatically transform input

data into tests, including both lower-order and higher-order thinking questions that evaluate different student abilities.

#### 4. Behavioural and Emotional Support

AI systems can analyse student data to identify those who might need additional emotional or behavioral support, helping educators intervene early and provide necessary assistance. Furthermore, knowing that students with special needs can rely on technology to compete with others gives them confidence to prove their worth and excel in the fields of their choice.

#### 5. Automated Administrative Tasks

AI can handle routine tasks like grading and scheduling, freeing up teachers to focus more on personalized instruction and student engagement. An inclusive classroom needs more groundwork and effort from the school management and teachers. This increases their load and can put extra stress on them. Fortunately, AI can handle the additional work if you make an informed decision about streamlining the admin tasks.

#### 6. Enhanced Accessibility

AI can provide real-time captioning and translation services, making it easier for students who speak different languages or have hearing impairments to participate in class. Accessibility is not limited to the physical arena, though that is definitely the foremost aspect to consider. Every part of the learning process can be made accessible to students when you build a holistic and inclusive classroom.

#### 7. Language Translation and Multilingual Support

AI-powered language translation tools enable students who speak different languages to access learning materials and interact with their peers and teachers. These tools break down language barriers and provide real-time translation, fostering more inclusive classrooms for non-native speakers and students in multicultural environments.

#### 8. Intelligent Tutoring Systems

AI-based tutoring systems can help bridge gaps for students who need additional support outside of the classroom. These systems use natural language processing and machine learning algorithms to provide instant feedback and assist in difficult subject areas. Intelligent tutoring can be especially useful for students with learning disabilities, providing them with continuous, customized support.

#### 9. Real-Time Feedback and Assessment

AI-driven assessment tools can continuously monitor a student's progress and provide real-time feedback. This not only helps teachers identify where a student is struggling but also allows for immediate intervention. For students with special needs, this continuous feedback loop enables tailored support, ensuring they are not left behind.

#### 10. Data-Driven Insights

AI tools can analyse large amounts of student data to uncover patterns in learning, identify at-risk students, and recommend targeted interventions. By providing data-driven insights, AI helps teachers understand how to better support diverse learners, making education more inclusive.

#### 11. Removing Bias in Education

AI has the potential to remove biases that may exist in traditional educational systems. Algorithms can help identify and correct prejudices in grading, assessment, and feedback, ensuring that all students are evaluated fairly, regardless of gender, ethnicity, or background.

#### 12. Virtual Classrooms and AI Teachers

AI can support virtual classrooms, making education more accessible for students who may be unable to attend school due to illness, disability, or geographical barriers. AI-powered virtual assistants and chatbots can help answer questions, provide guidance, and simulate classroom interactions, making learning more flexible and inclusive.

#### 13. Enhanced Collaboration

AI tools enable collaboration between students from different backgrounds, allowing them to work together in diverse learning environments. AI-driven platforms can facilitate group work, offer translation services, and adapt tasks to ensure that all students, including those with disabilities, can actively participate.

#### 14. Assistive Robots for Physical Disabilities

AI-powered robots, such as those used for mobility assistance or interaction, can help students with physical disabilities navigate the classroom, interact with their peers, and perform tasks that might otherwise be difficult. These robots can be integrated into both physical and virtual environments, creating an inclusive space for all students.

#### 15. Social-Emotional Learning

AI can also support social-emotional learning (SEL) by using emotion recognition technology to

understand a student's emotional state. This allows AI tools to recommend coping strategies or adjustments in teaching methods when students show signs of stress, frustration, or disengagement. AI systems can provide personalized encouragement, boosting self-esteem and fostering an inclusive, supportive environment.

These applications not only support students with disabilities but also enhance the overall learning experience for all students by making education more flexible, responsive, and inclusive.

## IX. CONCLUSION

AI is playing a trans-formative role in making education more inclusive, offering personalized and adaptable learning experiences, bridging language and communication gaps, and providing tools to support students with disabilities or learning challenges. As these technologies continue to evolve, they will help break down barriers to education, ensuring that all learners, regardless of their abilities or backgrounds, have equal opportunities to succeed. In conclusion, exploring the role of artificial intelligence (AI) in inclusive education reveals a promising path for transforming learning and enhancing accessibility for diverse learners. The integration of AI technologies has the potential to meet the unique needs of students with different abilities and learning styles, fostering a more inclusive educational environment. By offering personalized learning experiences, adaptable content, and real-time feedback, AI tools can address individual strengths and challenges, promoting a more equitable learning experience.

Additionally, AI's role in inclusive education extends beyond the classroom, potentially bridging geographical and socio-economic divides. AI-powered remote learning platforms can deliver quality education to under-served communities, ensuring that learners from diverse backgrounds gain access to valuable educational resources and opportunities.

However, it is crucial to implement AI in education with careful ethical consideration. Addressing concerns related to data privacy, algorithmic bias, and the digital divide is essential to prevent further inequality. Collaboration between educators, policymakers, and tech developers is key to

establishing ethical standards and regulations that protect the rights and well-being of all students.

Looking ahead, ongoing research and evaluation of AI's impact in inclusive education will be vital. Evidence-based practices and continuous refinement of AI algorithms will enhance the effectiveness of learning solutions. Involvement of educators in AI tool design and implementation will ensure alignment with teaching principles and improve the overall learning experience.

Ultimately, integrating AI into inclusive education has great potential to create a more accessible, personalized, and equitable learning environment. Through responsible implementation and continued collaboration, we can harness AI to eliminate barriers and empower learners of all abilities to succeed in an inclusive educational ecosystem.

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