ARTIFICIAL INTELLIGENCE, BARRIER BREAKERS IN THE 21ST CENTURY EDUCATION

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Abstract
Artificial intelligence (AI) is transforming the landscape of education, offering innovative solutions to address various challenges and enhance learning experience. Recent advancements in AI technologies have paved the way for personalized, adaptive, and inclusive educational approaches. This article examines the various applications and impact of AI that ranges from personalized learning experiences to data-driven decision-making, empowerment of educational facilitators and tutors, enhancement of student engagement thereby creating a more accessible and inclusive educational environment. Furthermore, the study seeks to provide insight into AI capability in breaking barriers and increasing accessibility in all educational settings and spaces. This study delves into the potentiality of AI for greater productivity, simplified procedures, and reduced obligations by analyzing the pros and cons of using AI in the educational sector. The results of this research help us better understand how AI may improve better educational delivery by stimulating new ideas and improving efficiency for both students and lecturers and or facilitators. The research recommends a strategic approach to AI adoption in the public sector, considering organizational, ethical, and societal implications while recognizing the possibility of AI's transformative impacts on governments' service provision.
Keywords: Artificial Intelligence, Educational Environment, Personalized Learning

Introduction

Artificial intelligence (AI) has quickly established itself as a transformative force in a wide range of industries, including education. The development of AI has resulted in an array of advancements and innovations that have impacted many facets of human life. As a fundamental component to societal evolution and individual development, education has had significant benefits from AI breakthroughs. The integration of AI in educational systems is altering the ways in which students learn, teachers educate, and institutions function. By personalizing learning experiences, automating administrative responsibilities, and delivering real-time feedback, AI is revolutionizing the educational landscape, bridging gaps, and encouraging a more inclusive and effective learning environment (Kamalov *et al*., 2023).

With no argument, Education is changing as a result of artificial intelligence (AI), which is proving to be a revolutionary force. With its promise to improve education, its emergence represents a major shift. With the ability to analyze each student's performance individually, modify information, and provide a customized learning experience, AI is making it possible to take a more personalized approach to learning. **Artificial intelligence** (AI) transcends physical classroom boundaries by enabling worldwide access to education via virtual platforms. Teachers can concentrate on more engaging and innovative parts of teaching by having routine activities automated by it. A more adaptable, captivating, and internationally accessible learning environment could be produced by AI as it develops further in the field of education. The introduction of Artificial Intelligence (AI) into education has brought about a radical change in the manner that knowledge is taught and learned. This section traces the origins of this paradigm shift by examining the history of AI uses in education. The creation of intelligent tutoring systems (ITS) in the 1970s and 1980s marked the beginning of AI's use in education. This was emphasized by Anderson *et al*. (1995) who noted that these early systems sought to offer individualised education by adjusting to the demands and learning preferences of each individual learner. However, the broad adoption of such systems was hindered by low processing power. In the last decade, the synergies between AI technologies and educational practices have further intensified, propelled by advancements in

machine learning, natural language processing, and cognitive computing. This era explored innovative applications, including chatbots for student engagement, automated grading and feedback, predictive analytics for student success, and various adaptive platforms for personalised learning. Yet, amid the technological strides, researchers also continued to grapple with persistent challenges and new dilemmas such as ensuring ethical use (Holmes *et al*., 2021), enhancing system transparency and explainability (Khosravi *et al*., 2022), and navigating the pedagogical implications of increasingly autonomous AI systems in educational settings (Han *et al*., 2023).

The introduction of ChatGPT (to date one of the most powerful AI chatbots by OpenAI) in November 2022 is significantly transforming the landscape of education, marking a new era in how learning is approached and delivered. This advanced AI tool has redefined educational paradigms, offering a level of personalization in learning that was previously unattainable. ChatGPT, with its sophisticated language processing capabilities, is quickly becoming a game-changer in classrooms, to provide tailored educational experiences that cater to the unique needs, strengths, and weaknesses of each student. This shift from traditional, uniform teaching methods to highly individualized learning strategies will most likely signify a major advancement in educational practices (Aristanto *et al*., 2023). ChatGPT's role in personalizing education is particularly noteworthy. By analyzing student data and employing advanced algorithms, GPT and other Large Language Models (LLMs) can create customized learning experiences, adapting not only to academic requirements but also to each student's learning style, pace, and preferences. This leads to a more dynamic and effective educational environment, where students are actively engaged and involved in their learning journey, rather than being mere passive recipients of information (Steele, 2023). Furthermore, LLMs have shown remarkable potential in supporting students with special needs. They provide specialized tools and resources that cater to diverse learning challenges, making education more accessible and inclusive (Garg & Sharma, 2020). Students who might have found it difficult to keep up in a conventional classroom setting can now benefit from AI's ability to tailor content and delivery to their specific needs, thereby breaking down barriers to learning and fostering a more inclusive educational atmosphere (Rakap, 2023). In all of this, the integration of language models like GPT into educational systems is not just a mere enhancement but has the potential to become an integral part of modern teaching and learning methodologies. ChatGPT in education can be a significant stride towards creating a more personalized, inclusive, and effective learning experience, preparing students not only for current academic challenges but also for the evolving demands of the future.

However, the many precious possibilities in positively transforming the education systems through AI also comes with some downsides. They can be summarized in several points (Adiguzel *et al*., 2023; Ji *et al*., 2023; Ng *et al*., 2023a, 2023b, 2023c. Teachers feeling overwhelmed because they do not have much knowledge of the technology and how it could best be used. Both teachers and students not being aware of the limitations and dangers of the technology (i.e. generating false responses through AI hallucinations). Students uncritically using the technology and handing over the necessary cognitive work to the machine. Students not seeking to learn new materials for themselves but instead wanting to minimize their efforts. Inherent technical problems that exacerbate malignant conditions, such as GPT-3, GPT-3.5 and GPT-4 mirroring math anxiety in students (Abramski *et al*., 2023).

Impact on breaking barriers and improving accessibility

Artificial Intelligence (AI) integration in education is a powerful force that is lowering obstacles and improving accessibility, not only a technical advancement. This section explores the revolutionary effects of AI and explains how it is promoting accessibility and inclusion in the education.

Breaking Geographical Barriers: Geographical restrictions have been eliminated by AI-powered online learning platforms, which now offer educational opportunities to people everywhere. Global access to education has been made possible via virtual classrooms, webinars, and AI-powered collaborative online tools (Alrasheedi *et al*., 2016). AI-powered technologies are transforming the way content and education are delivered, enabling personalized and adaptive learning experiences. Through AI algorithms, educational platforms can analyze individual learning styles, preferences, and performance data to tailor content and provide customized learning paths. This approach allows individuals to access educational

materials and resources that align with their specific needs, promoting engagement, comprehension, and retention.

Moreover, AI can overcome geographical limitations that hinder access to education. Remote and underserved communities can now benefit from virtual classrooms, online courses, and educational resources that were once out of reach. AI-powered chatbots and virtual assistants provide instant support and guidance, simulating a one-on-one learning experience irrespective of location. By leveraging AI, we can unlock the potential of individuals who were previously excluded from educational opportunities.

The power of AI extends beyond just content delivery. AI-driven platforms and tools are revolutionizing content creation, translation, and accessibility. Natural Language Processing (NLP) algorithms enable real-time translation of educational materials, making knowledge accessible to non-native speakers and people with language barriers. AI-based transcription services convert audio and video content into text, making it accessible to individuals with hearing impairments. These advancements break down barriers and create an inclusive learning environment for all. This is not just a technological revolution; it is a humanitarian opportunity. As we witness the transformative impact of AI in enabling access to content and education, we have a chance to unite as a global community. Let us embrace the power of AI to ensure that no one is left behind, regardless of their socioeconomic background, geographic location, or physical limitations. By leveraging AI to empower individuals through knowledge, we can foster a more inclusive and equitable world.

In this era of AI, let us come together, diversify our approaches, and celebrate the potential of technology to uplift humanity. By harnessing the power of AI to democratize education, we can unlock the brilliance within every individual, creating a future where knowledge knows no boundaries. It is yet another opportunity for humanity to demonstrate its resilience, compassion, and commitment to collective growth.

Addressing Diverse Learning Needs: The versatility of AI is essential for meeting a range of learning requirements. Personalized education plans are made possible by machine learning algorithms that examine individual learning patterns. Students with different learning styles, aptitudes, and preferences can especially benefit from this (Bao *et al*., 2019).

Supporting Special Education: AI has been extremely helpful in advancing special education. AI-powered assistive technologies enable more inclusive learning environments by offering students with disabilities individualized support (Higgins & Raskind, 2017).

Economic Accessibility: AI has made education more affordable by providing low-cost instructional options. Quality education is now more accessible, especially in areas with low resources, thanks to open educational resources, AI-driven tutoring systems, and reasonably priced online courses (Chen *et al*., 2018). AI has a significant impact on removing obstacles and enhancing accessibility in the classroom. AI is a driving force behind the development of a more inclusive and fair educational environment by addressing issues with geography, facilitating a diversity of learning demands, and improving economic accessibility.

AI and Personalized Learning

Personalized learning is a method of teaching that adjusts curriculum, pace, and content to each student's individual requirements, interests, and talents. This approach aims to create a customised learning experience that increases engagement and understanding by acknowledging that students differ in their learning styles, strengths, and preferences. Pane *et al*. (2017) carried out a thorough analysis of personalised learning and its efficacy. The study highlights how crucial it is to take into account a number of elements, such as customised material and technological integration, in order to successfully apply personalised learning strategies. Personalised learning is an educational paradigm that is focused on the individual student, recognising their uniqueness. Aiming to maximise learning opportunities for each student, personalised learning makes use of technology, modifies content, and fosters individual agency.

Key Components of Personalized Learning:

Individualized Content: Personalized education entails providing content that suits every learner's aptitude level and preferred method of learning. The selection of relevant content for each learner is mostly dependent on data analysis and adaptive educational technology (Pane *et al*., 2017).

Pacing and Progression: Students go through the course material at their own speed. By ensuring that students have the time and assistance necessary to fully grasp subjects before continuing, this method helps to avoid comprehension gaps (Pane *et al*., 2017).
Student Choice and Voice: By giving students the freedom to select projects, learning paths, and topics of interest, personalized learning empowers them to participate actively in their education. According to Parker *et al*. (2018), this fosters intrinsic motivation and autonomy.
Flexible Learning Environments: The setting can be modified to meet the needs of students with varying learning styles. This covers how the classroom is set up physically, how technology is used, and how different teaching techniques are incorporated (Parker *et al*., 2018).

How AI customizes education for individual needs
By providing students with individualised learning experiences that are catered to their specific needs, artificial intelligence (AI) is completely changing the educational landscape. Artificial Intelligence (AI) modifies instructional content, pacing, and support through advanced algorithms and adaptive technologies, resulting in a more adaptable and efficient learning environment. The usefulness of AI-driven adaptive learning systems in improving education is examined in Ishfaq's (2020) research. The paper focuses on how adaptive algorithms in AI support tailored learning experiences by enabling individualised material delivery and pacing. AI's capacity to personalise instruction to meet the demands of each learner is a ground-breaking development in educational technology. AI is creating a more inclusive and productive learning environment by utilising adaptable algorithms, offering personalised information, giving real-time feedback, and taking into account a variety of learning styles.
Adaptive learning algorithms are used by AI to continuously evaluate and analyse each student's performance. These algorithms dynamically modify the content and pace of training based on information about learning styles, progress, and areas of strength and weakness (Ishfaq, 2020). AI's capacity to provide personalized content is one of its main advantages in the educational space. By analysing a student's responses, machine learning models are able to discover knowledge gaps and provide tailored content to meet individual needs. This guarantees that students receive the appropriate degree of assistance and challenge (VanLehn, 2011). Artificial Intelligence enables prompt and customised feedback. AI-powered automated assessment systems provide insights into students' learning processes in addition to evaluating their responses. A more effective learning process is encouraged by the quick interventions and modifications made possible by this real-time feedback (Hu *et al*., 2020). AI programmes are made to identify and accommodate different learning methods. AI can tailor teaching strategies such that material is presented in a way that each learner finds engaging by examining patterns in how different students take in and remember information (Berg, 2016).

The Pros and Cons of AI in Educational Technology
In this modern world, integrating AI technology grows rapidly in education. AI is there to assist and make our day-to-day tasks lighter. With a proper prompt, any activity that you wish to get done will be accomplished in a matter of seconds. This is just one of the many Pros of AI, let's discuss more!

1. Improved Student Engagement and Motivation
The use of AI applications in teaching can enhance the learning experience in many ways such as personalized learning exercises thanks to AI algorithms or instant feedback and communication thanks to AI natural language processing. AI can also be employed to enhance gamified learning which can further make learning enjoyable, engaging, and rewarding. Using AI tools can guide educators to use a more interactive teaching approach which may result in increased engagement and motivation in the class as well as improved learning objectives.

2. Enhancing Student Performance

Another significant pro of artificial intelligence in education is that it can help enhance student performance with increased feedback. AI-powered systems can evaluate students' progress, provide them with targeted feedback, and identify areas where they need improvement. Moreover, AI can monitor students' behavior patterns, assess their attention levels, and determine if they need additional assistance in certain subjects, granular areas, or specific skills. Instant, AI-powered feedback along will enhanced learning experiences can be expected to push students' abilities to new heights.

3. Cost-Effective Learning

Using AI in Education can also reduce the cost of education from an educational institution's perspective, and quite significantly if used to its potential. AI can automate a number of tasks assigned to administration, teachers, IT, and more. For example, AI can take on daily tasks such as grading, scheduling, data management, and even tutoring. With AI in education, educational institutions can save on budget by cutting down resources required to operate efficiently, thereby increasing cost-effectiveness.

4. Continuous Evaluation and Improvement in the long run

Last on our Pros of AI list is continuous evaluation and improvement. AI-powered EdTech tools can easily collect, analyze, and provide report data to teachers on student learning outcomes and behavior patterns. By using predictive analytics, AI can provide educators with valuable insights from predicting future performance, providing personalized interventions, early identification of at-risk students, and refining instructional strategies.

This useful information can enable educators to have a more in-depth evaluation in understanding their student's strengths and weaknesses in the classroom. In addition, teachers can have the chance to take their teaching strategies to the next level and give the best learning experiences to their students (Adlawan, 2024).

Cons and Challenges of AI in Education

For every single thing in this world to be balanced, one must have Pros and Cons, and AI is not an exception of it. What can become a challenge in AI that we can consider as cons? Let's continue to identify.

1. Threat to Teacher's Job Security

First on the list are the threats to teachers' job security. This is not happening yet, but it is a concern that the advancement and adoption of AI could impact the need for certain job roles in education. The way AI continues to automate more aspects of the education process, there may be fewer demands for human educators, which could lead to both improved productivity and potential job loss.

2. Dehumanized Learning Experience

One of the biggest cons of AI in education is that it can dehumanize the learning experience. With AI algorithms generating content and deciding the pacing of the lessons, students may miss out on the nuanced approach that a human teacher can offer. Additionally, AI algorithms can perpetuate bias, meaning that they may fail to provide an inclusive and diverse curriculum that is tailored to the needs of every student.

3. Costly to Implement for Teachers

Another disadvantage of AI in education is that it can be costly to implement for teachers. Not all schools and educational institutions have a dedicated budget for investing in AI tools and technologies. Plus the cost of mass-implementing AI into schools may be too great at this time. If the teacher will be the one to shoulder the cost, it can be expensive, and challenging to maintain.

4. Dependence on Technology

As schools become increasingly reliant on AI-powered solutions, there is a risk that teachers and students may become too reliant on technology. In the long run, this dependence could result in the neglect of

important traditional teaching methods and the development of critical thinking and problem-solving skills (Adlawan, 2024).

Conclusion

With no argument, Education is changing as a result of artificial intelligence (AI), which is proving to be a revolutionary force. With its promise to improve education, its emergence represents a major shift. With the ability to analyze each student's performance individually, modify information, and provide a customized learning experience, AI is making it possible to take a more personalized approach to learning. The future of AI and education is *not* a foregone conclusion that we simply need to adapt to. Instead, the incursion of AI into education is definitely something that cannot be resisted and reimagined.

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