

The Impact of AI Application in Education on Students

Yijie Wang

University College London, London, United Kingdom

stnzy00@ucl.ac.uk

Abstract. Artificial intelligence (AI) is making rapid progress in education with the promise of personalized learning, intelligent instruction, and automated administration. This paper analyzes the impact of AI applications in education on students. This paper argues that this shift poses both ethical and practical challenges. For example, the use of AI may lead to data privacy and security issues for students. In addition, based on the difference in the distribution of educational resources, the use of AI makes the problem of educational inequality more obvious. Students' critical thinking skills are potentially declining due to their over-reliance on cutting-edge technology. Therefore, this paper emphasizes the need to ensure equitable access through resource allocation and enablement. At the same time, balancing the use of technology, establishing a legal framework, and implementing strong data protection safeguards are critical to maximizing the positive impact of AI in education. Students should pay attention to cultivating their own academic self-discipline and academic standards.

Keywords: Artificial Intelligence, personalized learning, administrative automation, educational technology.

1. Introduction

Present-day AI applications in education are characterized by their potential for adaptation and quick development. AI technologies are enhancing learning experiences and outcomes for students worldwide, offering personalized learning paths, intelligent tutoring, and streamlined administrative processes. These advancements are profoundly transforming traditional educational paradigms. However, addressing the practical and ethical concerns around the utilization of AI in education is crucial to fully unlock its capabilities. This essay explores the present applications of artificial intelligence in education, the associated limitations, and potential strategies for dealing with these challenges.

2. The Present-Day Status of Artificial Intelligence in Education

The current scenario of AI in student education is characterized by fast progress and substantial promise. Artificial Intelligence (AI) is playing an increasingly important role in the field of education, improving the quality of learning and the results achieved by students throughout the world. From personalized learning to administrative efficiency, AI is reshaping the educational landscape, profoundly transforming traditional educational paradigms. To fully reap the benefits of its usage, it must confront the moral and practical issues raised by its application. As AI advances, it is likely to have a greater impact on education, offering new opportunities to enhance teaching and learning.

2.1. Personalized Learning

A prominent use of artificial intelligence in the field of education is personalized learning, which involves customizing classes to meet the specific needs, interests, and learning pace of individual students. AI-driven systems leverage data analytics to understand the strengths and weaknesses of each student, thereby providing customized learning paths and resources. Platforms such as Khan Academy and Duolingo, for example, utilize artificial intelligence (AI) algorithms to adjust the difficulty level of exercises based on the student's performance, ensuring that pupils are neither excessively nor insufficiently challenged [1]. This personalization is achieved through adaptive learning technologies that continuously assess students' progress and provide real-time feedback.

When a learner is having trouble understanding a subject, these systems can recognize it and provide more practice problems, clarifying films, or other learning tools to help them get the hang of it. This targeted support helps bridge knowledge gaps more effectively than traditional one-size-fits-all educational approaches [2]. Additionally, by enhancing learning through relevance and interaction, AI-powered personalized learning encourages student engagement. AI can make learning more engaging and exciting by, for instance, suggesting interesting topics or customizing examples to fit a student's interests and hobbies. As students receive immediate feedback and see their progress, they are more likely to stay motivated and committed to their studies [3]. AI-driven personalized learning also supports differentiated instruction, enabling educators to meet a range of students' requirements in a single classroom. Educators can use AI tools to identify which students need additional support and which ones are ready for more advanced challenges. This enables teachers to focus their attention where it is most needed, enhancing the overall learning experience for all students [4]. In addition to academic support, AI can personalize other aspects of the educational experience. For instance, it can recommend extracurricular activities or career paths based on a student's interests and strengths, helping them make informed decisions about their future. This comprehensive approach to individualized learning guarantees that students obtain a balanced education, equipping them for academic achievements and personal satisfaction [5].

2.2. Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) are among the most innovative applications of AI in education. They offer personalized help and direction that nearly perfectly mimics a one-on-one meeting with a human teacher. These systems use sophisticated algorithms and machine-learning techniques to provide feedback and guidance, adapting in real time to each student's individual learning needs and paces [6]. One prominent example of ITS is Carnegie Learning's MATHia, an AI-based tutor designed to enhance students' math skills. MATHia employs cognitive science principles to diagnose students' understanding and misconceptions, providing targeted interventions and tailored practice problems. Studies have demonstrated that students using MATHia show significant improvements in their math performance compared to those receiving traditional instruction alone [7]. ITS are particularly effective because they offer immediate and personalized feedback, helping students to correct errors and deepen their understanding. In contrast to typical classroom settings where feedback may take some time to come, students may learn from their mistakes in real time with rapid feedback from ITS [8]. This instantaneous feedback loop is essential for boosting confidence and consolidating learning. In addition, ITS can modify task complexity in response to student performance. For instance, if a student is having trouble understanding a certain concept, the system may provide easier assignments or more detailed explanations to help them grasp the course. If a student performs well, the system might provide progressively difficult challenges to keep them interested and motivated [9]. The capacity of ITS to gather and examine vast volumes of data on student performance is another benefit. Teachers can get important insights into student learning by using this data to spot patterns and trends. For example, by highlighting frequent misunderstandings or areas in which a lot of students struggle, ITS enables teachers to modify their lesson plans accordingly [6]. ITS are not limited to STEM subjects; they are also being developed for language learning, history, and other disciplines. For example, Project Listening's Text A tutor helps pupils read aloud and provides guidance on pronunciation and understanding, which greatly enhances the reading abilities of young children [6].

2.3. Administrative Task Automation

AI is also making administrative work more efficient, freeing up teachers to concentrate more on instruction. Automated grading systems, such as Gradescope, use AI to grade assignments quickly and consistently, reducing the workload on teachers [10]. Additionally, attendance and student record management are handled by AI-powered technologies, and even to predict and address potential dropouts, ensuring that administrative tasks are handled efficiently and accurately. Automated

grading systems are among the most impactful AI applications in administrative task automation. Tools like Gradescope use machine learning algorithms to evaluate student submissions quickly and consistently, handling a variety of formats from handwritten to typed responses. These systems not only save time but also reduce the potential for human error and bias in grading [11]. As a result, teachers have more time to dedicate to classroom activities and individualized student support. Keeping track of student records is another area where AI greatly improves productivity. Automation of the gathering, organizing, and analyzing of student data is possible with AI-driven solutions, guaranteeing accuracy and legal compliance. For instance, systems powered by AI can track attendance, monitor academic progress, and even predict at-risk students by analyzing patterns and trends in the data [12]. This proactive approach allows educators to intervene early and provide necessary support to improve student outcomes. Scheduling is another administrative task that benefits from AI automation. AI algorithms can optimize class schedules, taking into account factors such as teacher availability, classroom resources, and student course preferences. This optimization minimizes conflicts and overlaps while ensuring that resources are used effectively and that students may obtain the courses they need [9]. AI-powered solutions also facilitate easier communication between parents, teachers, and students. Virtual assistants and chatbots can help with enrolment procedures, answer common questions, and give details about school events. These AI systems can run around the clock, responding instantly and freeing up administrative workers to work on more difficult jobs [13]. Additionally, AI can personalize communications based on individual student data, ensuring that messages are relevant and timely. Furthermore, AI-powered predictive analytics play a critical role in improving administrative decisions. By analyzing past data, AI systems can estimate enrolment trends, determine resource requirements, and aid with budget planning. This data-driven approach promotes informed and strategic planning, resulting in more efficient and successful educational settings [14].

3. The Negative Consequences of Artificial Intelligence in Education

While AI has the potential to revolutionize education, it also brings several negative consequences that must be addressed. Issues related to data privacy, equity, over-reliance on technology, and a decline in critical thinking abilities draw attention to the necessity of cautious AI adoption and control in educational contexts. Weighing the advantages of AI against any potential drawbacks is essential if people want to guarantee that every child receives an equal and comprehensive education.

3.1. Data Privacy Concerns

Data privacy concerns are among the most significant negative consequences of incorporating Artificial Intelligence (AI) into student education. Large volumes of data are needed for AI systems to deliver personalized learning, predictive analytics, and other educational benefits. However, there are significant privacy and security concerns raised by the gathering, storing, and use of this data, which demand attention. The management of sensitive student data is one of the main issues with the application of AI in education. For AI systems to work well, enormous volumes of data are needed, including behavioral, intellectual, and personal data. There are serious privacy hazards associated with the gathering and storage of this data. If these systems are not adequately protected, there is a risk of data breaches that could expose students' personal information to unauthorized individuals [15]. Additionally, the use of AI brings up concerns about data ownership and its usage, which could lead to misuse or exploitation.

AI systems in education collect a lot of data, including behavioral, academic, and, in certain situations, biometric data from students as well as personal information about them. This extensive data collection is necessary for AI to accurately analyze and predict students' needs and performance. However, it also means that educational institutions must handle an enormous amount of sensitive information, increasing the risk of data breaches and unauthorized access [15]. Another critical issue is the matter of informed consent and the ethical use of student data. Students and their parents are

often unaware of the extent to which their data is being collected and used by AI systems. The lack of transparency can lead to mistrust and resistance to AI technologies in education. Furthermore, questions arise about who owns the data and how it can be used. There are concerns that data collected for educational purposes might be repurposed for commercial gain or shared with third parties without proper consent [16]. The long-term storage of student data raises concerns about surveillance and the potential misuse of information. Educational AI systems often keep records of student's activities and performance over time, creating detailed profiles that can be used to monitor and evaluate their behavior. While this data can provide valuable insights for personalized learning, it also risks creating an environment of constant surveillance, which can affect students' freedom and autonomy [17]. Additionally, there are fears that such data could be used to unfairly track or label students, impacting their future opportunities.

3.2. Equity and Access Issues

Existing disparities may be made worse by AI in education. Advanced AI-driven learning tools are frequently dependent on the availability of resources, which are not always available. Examples of these resources are current gadgets and high-speed internet. Students from underprivileged backgrounds may not benefit equally from AI technologies, widening the educational gap between affluent and disadvantaged students [18]. Furthermore, because AI systems can reinforce biases present in the data they are trained on, specific student groups may be subjected to unjust treatment by these systems. For instance, students from minority backgrounds may be unfairly penalized by an AI grading system that is based on biased data [19].

3.3. Negative Effects of Relying on Technology

The negative consequence of AI in education is the potential for over-reliance on technology. Although AI can offer individualized learning experiences and helpful support, there is a chance that teachers and students could grow overly reliant on these technologies. This reliance may lessen the importance of social connection in the classroom, which is essential for fostering the growth of critical thinking, emotional intelligence, and social skills [20]. If AI is used too often, it may cause learning to become more solitary and deprive students of the advantages of group projects and in-person interactions with classmates and professors. Another negative consequence is the reduction of critical thinking skills since AI-driven educational tools often provide students with quick answers and solutions, which can undermine the development of critical thinking skills. Students may not participate in the deeper cognitive processes necessary to analyze, synthesize, and evaluate material when they rely on AI to answer issues and finish assignments [21]. This can lead to a surface-level understanding of subjects and hinder the development of important problem-solving skills that are essential for lifelong learning and adaptability. Over-reliance on Artificial Intelligence (AI) in education can also lead to significant problems, including issues with academic self-discipline and an increase in academic misconduct. When students become overly dependent on AI tools for tasks such as writing, problem-solving, and studying, they may not develop essential skills in self-regulation and independent thinking. This dependency can erode their ability to manage their learning autonomously and reduce their intrinsic motivation to engage with the material [22]. Additionally, the ease of access to AI-driven solutions can facilitate academic misconduct, such as plagiarism and cheating. Students may be enticed to turn in AI-generated work as their own if AI tools are available that can create essays or solve difficult issues, compromising the validity of the educational process [23]. To mitigate these issues, it is crucial to balance the use of AI with traditional teaching methods that promote self-discipline and ethical academic practices.

4. The Potential Solutions to the Negative Consequences of Utilizing AI in Education

The integration of Artificial Intelligence (AI) in education has transformative potential, but it also brings several negative consequences that need to be addressed. Solutions to these challenges involve enhancing data privacy, ensuring equitable access, balancing technology use with human interaction, and promoting the development of critical thinking skills.

4.1. Enhancing Data Privacy

To address data privacy concerns, educational institutions must implement robust security measures and clear policies. Secure data storage systems and advanced encryption technologies should be utilized to protect sensitive student information. Regular vulnerability assessments and security audits can help identify and mitigate potential threats [24]. Additionally, transparent and clear data policies should inform parents and students about the types of data collected, their usage, and who has access to them. Implementing stringent consent protocols ensures that data collection and usage adhere to ethical standards [16].

4.2. Ensuring Equitable Access

To prevent AI from exacerbating educational inequities, efforts must be made to ensure equitable access to AI technologies. This entails giving all students—especially those from disadvantaged backgrounds—access to the essential infrastructure, such as contemporary gadgets and fast internet. Initiatives from the public and commercial sectors can be extremely important in closing the digital gap by sponsoring technology access programs and giving low-income families subsidies [18]. Moreover, designing AI systems that are culturally responsive and inclusive can help address biases and ensure that all student groups benefit from AI-enhanced education [19].

4.3. Balancing Technology Use with Human Interaction

Even though AI can improve learning, it's important to strike a balance between technology and human contact. The proper integration of AI technologies into teaching techniques should be taught to educators, who should use them to enhance rather than replace in-person learning. This balanced approach can ensure that students continue to develop social skills, emotional intelligence, and critical thinking abilities through direct interactions with teachers and peers [20]. Schools should promote collaborative learning environments where technology supports, rather than dominates, the educational process.

4.4. Promoting Critical Thinking Skills

To counteract the potential reduction of critical thinking skills, educational curricula should emphasize activities that require higher-order thinking. AI tools can be designed to challenge students with complex problems that require analysis, synthesis, and evaluation, rather than just providing quick answers [21]. Additionally, educators can use AI to identify areas where students struggle and provide targeted support that encourages deep learning and problem-solving. By integrating AI in a way that promotes active engagement and critical reflection, schools can help students develop the skills necessary for lifelong learning.

4.5. Regulatory and Ethical Frameworks

Strong legal and ethical frameworks are necessary for the effective use of artificial intelligence in education. To address the challenges posed by AI and big data, policymakers should revise existing laws, such as the Family Educational Rights and Privacy Act in the United States [15]. Guidelines for data privacy, equity, transparency, and accountability should be included in these frameworks to guarantee the moral and efficient application of AI technologies in educational settings. Creating

quality standards and integrating AI in education requires cooperation between legislators, innovators, and educators.

5. Conclusion

AI has the potential to revolutionize education by offering personalized learning, intelligent tutoring systems, and efficient administrative automation. However, its integration also presents significant challenges, including data privacy concerns, equity issues, over-reliance on technology, and the reduction of critical thinking skills. Addressing these challenges requires robust data privacy measures, equitable access to technology, balanced use of AI with human interaction, and strong regulatory and ethical frameworks. By effectively managing these issues, it can ensure that AI enhances education and provides a fair and comprehensive learning experience for all students.

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