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### THE IMPACT OF ARTIFICIAL INTELLIGENCE IN EDUCATIONAL SYSTEM

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#### ABSTRACT

The way we teach and learn could be completely transformed by artificial intelligence (AI), which could make the process more efficient, personalized, and interesting. Artificial intelligence (AI) in education is the application of AI technologies, like natural language processing and machine learning, to improve the educational process. Through the use of algorithms, teachers are able to customize learning for each student by analyzing data, finding trends, and making predictions. Artificial intelligence (AI) and its potential impact on education have gained widespread attention because of ChatGPT's impressive performance on standardized academic assessments. For the development and implementation of AI-driven technologies in schools, colleges, and universities to be sustainable, a thorough knowledge of their effects on the current educational system is needed. The application of AI in education has a lot of potential advantages. One of the biggest benefits of AI in education is personalized learning, which allows students to learn at their own pace and in a fashion that best fits their learning preferences. This can improve student results. Chatbots, automated grading and evaluation, and intelligent tutoring systems can boost productivity, free up teachers' time, and deliver more precise and consistent feedback. Some of the challenges that need to be resolved are potential bias, cost, lack of confidence, and privacy and security concerns. AI can improve data analysis, empowering teachers to make facts-based decisions. There are some impacts of artificial intelligence in educational system that are covered in this review. These are the applications of artificial intelligence in automated assessment, intelligent tutoring systems, personalized learning, and collaborative teacher-student learning.

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## INTRODUCTION

The advent of Artificial Intelligence (AI) has heralded a new era of innovation and transformation across various sectors, with education standing out as one of the most profoundly impacted fields. As educational institutions strive to meet the diverse and evolving needs of learners in a rapidly changing world, AI emerges as a powerful tool capable of redefining traditional teaching and learning paradigms.<sup>[1]</sup> From personalized learning experiences and intelligent tutoring systems to administrative efficiency and enhanced student engagement, AI's influence on education is both extensive and multifaceted.<sup>[2]</sup> The potential for AI to revolutionize education is vast, promising tailored instructional methods, intelligent tutoring, and efficient management tools that can cater to diverse student needs and optimize teaching practices. However, this technological advancement also raises important questions about equity, privacy, and the role of human educators.<sup>[3]</sup> However, this technological revolution also brings to light critical considerations surrounding ethics, privacy, and equity.<sup>[4]</sup> As we delve into the impact of AI on the educational system, it becomes evident that while AI holds the promise of significant advancements and improvements, it also necessitates a thoughtful approach to ensure its benefits are maximized while addressing potential challenges.<sup>[5]</sup>

## BENEFITS OF AI IN EDUCATION

The impact of artificial intelligence (AI) on the educational system is multifaceted and transformative, offering both opportunities and challenges. Here are some key aspects of this impact:

### 1. Personalized Learning<sup>[6]</sup>

AI enables personalized learning experiences by adapting educational content to meet the needs of individual students. Algorithms can analyze a student's strengths, weaknesses, and learning style to tailor lessons, exercises, and resources. This helps in addressing diverse learning paces and preferences, potentially improving overall learning outcomes.

### 2. Intelligent Tutoring Systems<sup>[7]</sup>

AI-powered tutoring systems provide students with immediate feedback and assistance. These systems can simulate one-on-one tutoring, offering explanations, practice problems, and guidance tailored to the student's level of understanding. This can be particularly beneficial for subjects where students may need extra help outside regular class hours.

### 3. Administrative Efficiency<sup>[2-3]</sup>

AI can streamline administrative tasks such as grading, scheduling, and enrollment management. Automated grading systems can handle multiple-choice tests and even some essay evaluations, freeing up educators to focus more on teaching and student interaction. AI-driven tools can also help in managing school operations and logistics.

### 4. Data-Driven Insights<sup>[8]</sup>

AI can analyze vast amounts of educational data to provide insights into student performance, teaching effectiveness, and curriculum efficacy. This data-driven approach helps educators and administrators make informed decisions, identify trends, and implement strategies to enhance the learning environment.

### 5. Enhancing Engagement<sup>[9]</sup>

AI can be used to create interactive and engaging educational content, such as simulations, virtual reality (VR) experiences, and gamified learning activities. These tools can make learning more immersive and enjoyable, potentially increasing student motivation and engagement.

### 6. Accessibility and Inclusivity<sup>[6-7]</sup>

AI technologies can improve accessibility for students with disabilities. Tools like speech-to-text, text-to-speech, and language translation can help accommodate diverse learning needs and ensure that educational materials are accessible to all students.

### 7. Teacher Support and Development<sup>[9-10]</sup>

AI can assist teachers by providing professional development resources, teaching aids, and lesson plans. AI-driven platforms can also analyze classroom interactions and provide feedback to help teachers improve their instructional techniques and classroom management.

### 8. Ethical and Privacy Concerns<sup>[7-8]</sup>

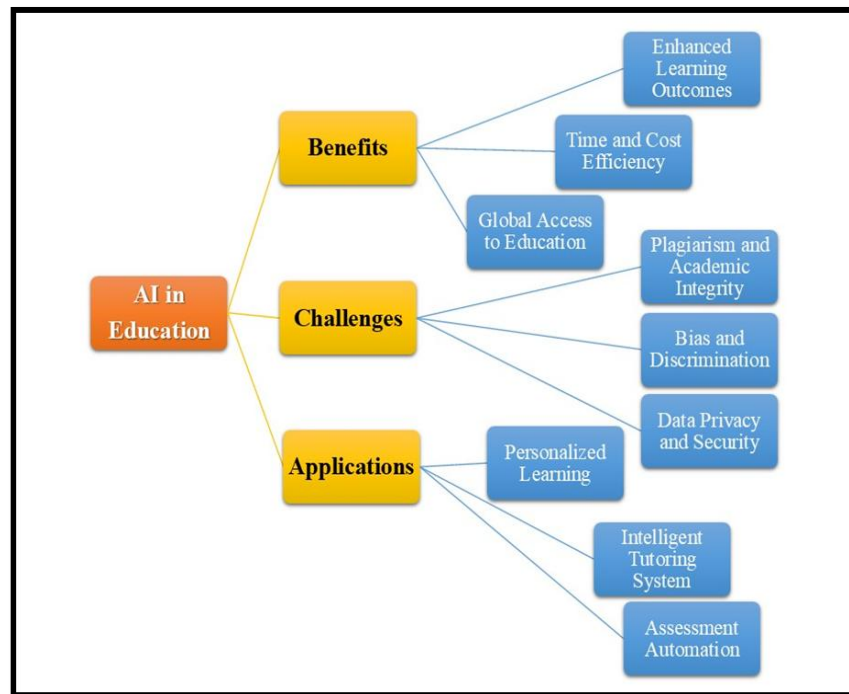
The use of AI in education raises important ethical and privacy issues. Ensuring data security, protecting student privacy, and addressing biases in AI algorithms are critical concerns that need to be managed. There is also the risk of over-reliance on technology, which could affect the human aspects of teaching and learning.

### 9. Equity and Access<sup>[10-11]</sup>

While AI has the potential to democratize education by providing resources and support to underserved areas, there is a risk that it could exacerbate existing inequities. Access to AI tools and technology may be uneven, potentially widening the gap between well-resourced and under-resourced educational settings.

## 10. Future Skills<sup>[12]</sup>

AI in education emphasizes the importance of developing skills for the future job market. Students may need to acquire competencies in AI and related fields, such as data analysis and digital literacy, to succeed in a technology-driven world.



**Figure 1: Multifaceted impact of AI in education<sup>[13]</sup>**

Figure 1 depicted that the multifaceted impact of AI in education. Benefits, challenges and applications of AI in educational system are shown in this figure.

## AI IN GRADING AND ASSESSMENT PROCESS

The integration of AI in the grading and assessment process is a significant advancement in education, bringing a range of benefits and challenges. Here's an overview:

### 1. Automated Grading

**Objective and Consistent Evaluation:** AI can grade multiple-choice questions, fill-in-the-blank answers, and even some forms of essay writing with a high degree of consistency. This reduces human error and bias, ensuring that all students are assessed fairly.<sup>[14]</sup>

- **Scalability:** AI systems can handle large volumes of grading, making it possible to assess thousands of students efficiently. This is particularly useful in massive open online courses (MOOCs) or large universities.<sup>[13]</sup>
- **Speed:** AI can provide almost instant feedback, allowing students to learn from their mistakes and improve before the next assessment.<sup>[13-14]</sup>

### 2. Personalized Feedback

- **Adaptive Learning:** AI can analyze students' performance and provide personalized feedback, highlighting strengths and areas for improvement. This helps in creating a tailored learning path for each student.<sup>[15]</sup>
- **Continuous Assessment:** Instead of relying solely on final exams, AI can facilitate ongoing assessments that adapt to a student's progress, ensuring a more accurate representation of their knowledge and skills.<sup>[15-16]</sup>

### 3. Essay Grading

- **Natural Language Processing (NLP):** AI uses NLP to evaluate essays, checking for grammar, coherence, argument strength, and other criteria. While still in development, these systems can provide valuable feedback and approximate human grading.<sup>[17]</sup>
- **Bias Reduction:** Although AI grading is more consistent, there's an ongoing challenge to ensure that the algorithms do not perpetuate biases, especially those related to language use, cultural references, or socioeconomic background.<sup>[17-18]</sup>

### 4. Plagiarism Detection

- **Originality Checks:** AI-powered plagiarism detection tools like Turnitin or Grammarly can scan assignments for copied content across vast databases and the internet. This ensures academic integrity and discourages cheating.<sup>[16-17]</sup>
- **Paraphrasing Detection:** Advanced AI can even detect paraphrased content, which is more difficult for traditional plagiarism checkers to identify.<sup>[15]</sup>

## 5. Predictive Analytics

- **Early Intervention:** AI can analyze students' performance data over time to predict future outcomes, such as the likelihood of dropping out or failing a course. Educators can use this information to intervene early, providing support where needed.<sup>[18-19]</sup>
- **Data-Driven Insights:** AI can help educators identify trends in student performance, informing curriculum adjustments or targeted teaching strategies.<sup>[17-18]</sup>

## AI CHATBOTS IN EDUCATION

AI chatbots in education are revolutionizing the way students, educators, and institutions interact with learning processes. By automating tasks, providing personalized support, and enhancing engagement, AI chatbots are becoming integral to modern education systems.<sup>[19]</sup> Chatbots are computer programs that mimic human conversation and may communicate with users via voice or text chat interfaces.<sup>[19-20]</sup> Chatbots have been employed in education more and more in the past few years, giving students individualized support, automating administrative duties, and creating new avenues for interaction.<sup>[19]</sup> Using chatbots in education has many advantages, one of which is their capacity to offer students individualized support. Chatbots have the potential to serve as online instructors, offering immediate feedback, responding to inquiries, and assisting students with their educational process.<sup>[20]</sup> In addition to offering a more customized learning experience, chatbots can also track progress, identify areas for growth, and make personalized recommendations for learning materials. The ability of chatbots to automate administrative work is another advantage of their use in education.<sup>[21]</sup> Teachers can focus on higher-value activities like teaching and mentoring by using chatbots to perform repetitive duties like scheduling, grading, and responding to commonly requested inquiries.<sup>[20-21]</sup> Additionally, by reducing administrative errors and inconsistencies, this automation may guarantee that activities are executed precisely and effectively.<sup>[22]</sup> Chatbots have the potential to enhance student motivation and active learning by making the learning process more dynamic and captivating. By providing prizes and incentives for completing activities and meeting learning objectives, chatbots can also be used to gamify learning.<sup>[23]</sup> Notwithstanding chatbots' educational advantages, there are certain issues that still need to be resolved. One difficulty lies in making sure chatbots are created with the needs, interests, and learning styles of students in mind, using a student-centered design approach.<sup>[21]</sup> Designing chatbots with accessibility in mind is also necessary to make sure that all students can utilize and access the technology.<sup>[22-23]</sup> We have to make sure that chatbots are dependable and accurate so that they deliver accurate information without bias or error.<sup>[23]</sup>

## PERSONALIZED LEARNING

The way students learn has been revolutionized by the use of artificial intelligence (AI) in education, which has made individualized learning possible.<sup>[23]</sup> A teaching strategy known as "personalized learning" adjusts lessons to the unique requirements, interests, and strengths of each student. Through the use of technology, personalized learning adjusts lessons to the level and speed of each learner.<sup>[23-24]</sup> Through the use of machine learning algorithms to evaluate data and find trends in students' learning behaviors, preferences, and accomplishments, artificial intelligence (AI) plays a crucial role in personalized learning.<sup>[24]</sup> With this information, AI can then create customized learning programs that are matched to the individual needs of every learner. AI is able to suggest relevant learning materials, point out areas that need work, and modify the degree of difficulty of learning assignments.<sup>[25]</sup> Making ensuring every student gets the assistance and direction they require to realize their full potential is one of the main advantages of individualized learning. While advanced students might be pushed at their level, struggling students can benefit from personalized instruction to help them catch up.<sup>[26]</sup> Additionally, AI is able to adjust its speed of instruction to match the learning pace of the student, if needed. Numerous educational contexts, including colleges, universities, corporate training, and schools, have effectively adopted AI-based individualized learning.<sup>[24-25]</sup>



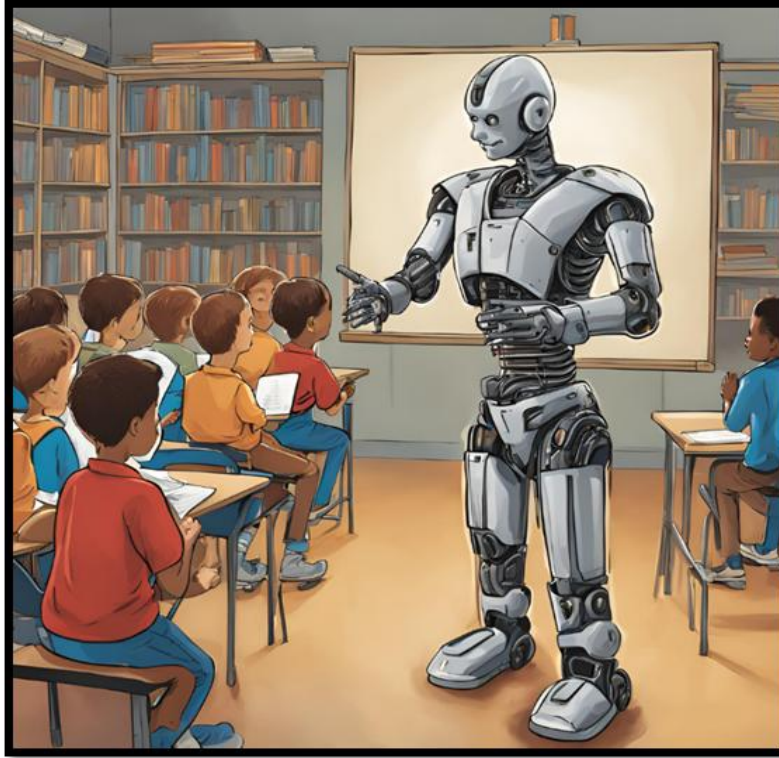
**Figure 2: AI based Personalized Learning<sup>[13]</sup>.**

**Figure 2** depicted that it is a AI based personalized learning. It is also called an AI based digital learning. Here, a boy is learning through AI platform. This picture was generated through **Canva AI Image Generator**.

#### **INTELLIGENT TUTORING SYSTEMS**

Intelligent tutoring systems (ITS), which aim to give students individualized, one-on-one instruction that replicates the experience of learning from a human tutor, could be accelerated by AI technology.<sup>[26]</sup>ITS uses strong algorithms and machine learning techniques to comprehend the learning requirements of students and personalize their instruction.<sup>[27]</sup> AI can now read and comprehend written or oral input from students thanks to natural language processing (NLP), which enables ITS to hold meaningful conversations, respond to inquiries, and offer teaching on a range of topics.<sup>[26-27]</sup> ITS uses AI to bridge the gap between traditional classroom learning and one-on-one tutoring by giving students personalized teaching and feedback. Another essential part of ITS is student modeling.<sup>[27-28]</sup> Through their interactions with the system, artificial intelligence creates dynamic models of students' knowledge, abilities, and preferred methods of learning. These models help ITS identify misconceptions, areas where students might need more assistance, and their current level of subject comprehension.<sup>[26]</sup> These tools evaluate how students learn, monitor their development, and provide tailored advice, all of which enhance learning results and boost student enthusiasm.<sup>[27]</sup>





**Figure 3: Tutoring session being led by an intelligent humanoid<sup>[13]</sup>**

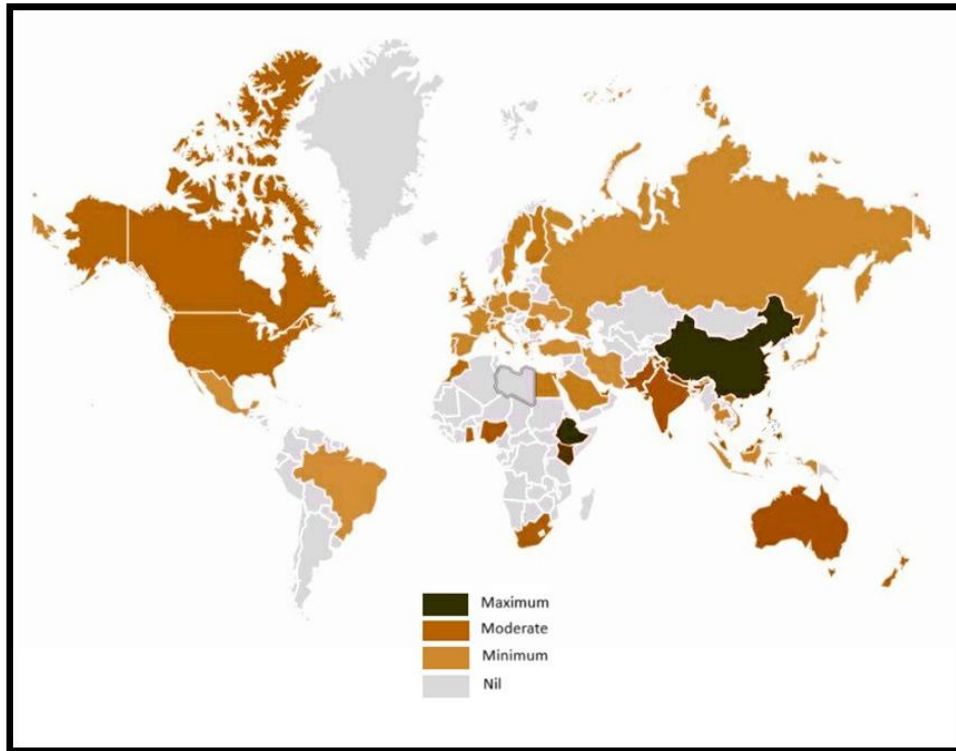
**Figure 2** depicted that an intelligent humanoid conducting a tutoring session where students are present. This picture was generated through **Canva AI Image Generator**.

### **TEACHER – STUDENT COLLABORATION**

Artificial Intelligence (AI) has the potential to enhance the learning process by facilitating collaboration between teacher and students.<sup>[28]</sup> AI can offer real-time analytics and insights, which can assist educators in identifying students' strengths, weaknesses, and learning patterns. Based on this information, educators can modify their teaching strategies accordingly.<sup>[29]</sup> AI can also be used to notify teachers when and which students are struggling and provide possible remedies. Finally, AI can act as a brainstorming partner, helping educators come up with creative solutions to support student learning.<sup>[30]</sup> AI technology can assist educators in responding to a range of queries from students during class. Since human teachers are restricted in their knowledge, students' unexpected and unconventional inquiries may present a difficulty. Artificial Intelligence (AI) can bridge knowledge gaps and offer superior answers to inquiries from students.<sup>[27-28]</sup> AI-driven chatbots can respond to questions from students and help with peer-to-peer communication, encouraging a cooperative learning atmosphere.<sup>[29]</sup>

### **WORLDWIDE ACCESSIBILITY OF SUPERIOR QUALITY EDUCATION**

One of the main problems in many developing countries is the lack of access to high-quality education.<sup>[30]</sup> The foremost authorities in international education share this opinion. Offering universal education offers significant financial advantages for both individuals and nations since it is a key component in stimulating economic growth.<sup>[29-30]</sup> The development of AI has made major strides possible in improving access to high-quality education globally.<sup>[31-32]</sup> As a result, there has been a lot of interest in AI-based education lately from all around the world. AI-powered educational resources and applications can transcend linguistic, socioeconomic, and geographic barriers to provide knowledge more fairly.<sup>[12-14]</sup> In this context, it's critical to take into account the technological difficulties associated with delivering AI-based education in remote areas.<sup>[13]</sup>



**Figure 4: The region-specific popularity of the search term "AI in education"<sup>[13]</sup>**

**Figure 4** depicted that the region-specific popularity of the search term "AI in education". Colour charts are given in the figure for better understanding the uses of AI in educational system globally.

## DISADVANTAGES OF AI IN EDUCATIONAL SYSTEM

While AI offers many benefits to the educational system, there are also several potential disadvantages and challenges to consider:

- 1. Privacy Concerns:** The collection and analysis of vast amounts of student data by AI systems raise significant privacy issues. There are risks related to data security and the potential misuse of personal information.<sup>[33]</sup>
- 2. Bias and Inequity:** AI systems can inadvertently perpetuate existing biases if they are trained on biased data. This can lead to unequal educational experiences and outcomes for different groups of students.<sup>[34]</sup>
- 3. Dependence on Technology:** Over-reliance on AI tools may lead to a decrease in critical thinking and problem-solving skills. Students and educators might become too dependent on technology, which could affect their ability to function without it.<sup>[35]</sup>
- 4. Cost and Accessibility:** Implementing AI solutions can be expensive, potentially exacerbating existing disparities between well-funded and underfunded educational institutions. Smaller or less affluent schools may struggle to afford and integrate advanced AI technologies.<sup>[36]</sup>
- 5. Job Displacement:** The automation of tasks such as grading and administrative work could potentially displace some educational jobs. While AI might support educators, it could also reduce the need for certain administrative or support roles.<sup>[37]</sup>
- 6. Quality and Accuracy:** AI tools are not infallible and may produce incorrect or misleading results. Inaccurate feedback or assessments can negatively impact students' learning experiences.<sup>[38]</sup>
- 7. Lack of Human Interaction:** AI cannot replace the nuanced, empathetic interactions between teachers and students. The human elements of teaching, such as mentoring and emotional support, are crucial for student development.<sup>[39]</sup>
- 8. Ethical Concerns:** The use of AI in education raises ethical issues, such as the potential for surveillance and the commercialization of educational data. There are also concerns about how AI decisions are made and who is responsible for them.<sup>[40]</sup>
- 9. Resistance to Change:** Both educators and students may resist adopting AI technologies due to unfamiliarity. Integrating AI into existing educational practices can be challenging and may meet with resistance from those accustomed to traditional methods.<sup>[41]</sup>
- 10. Technical Challenges:** Implementing and maintaining AI systems require technical expertise and infrastructure. Schools may face difficulties in ensuring that AI tools are properly integrated and supported.<sup>[42]</sup>

## CONCLUSION

AI in education has numerous advantages, but there are also a number of issues and worries that need to be resolved. Institutions need to make sure they are taking the necessary precautions to protect students' privacy and avoid bias, as well as carefully assessing the advantages and disadvantages of integrating AI systems in the classroom. We can give every student a more individualized, effective, and efficient learning experience by balancing the advantages and disadvantages of artificial intelligence in the classroom.

## AUTHORS CONTRIBUTION STATEMENT

Ms. Dipanwita Bit and Mr. Souvik Biswas designed the work and did the overall planning. Ms. Taniya Majumder and Mrs. Silpa Guha Samanta reviewed literature, collected all the data and drafted the manuscript accordingly. Mr. Souvik Biswas edited all the pictures and checked the similarity index. Dr. Mrinmoy Nag checked the grammatical mistake and guided co-authors during the drafting of the manuscript.

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## CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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