Role of Artificial Intelligence in Ducation: Do and Don'ts, Scope and Limitations

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Abstract

The increasing availability of Artificial Intelligence and related tools and technologies has made it possible to use AI in various domains of life. In the current paper, we, by using previous empirical and theoretical studies, provided an overview of the use of AI in the education field, its related challenges, and future opportunities. We also noted that AI applications in the education field include enabling the preparation of content, assignments, automated grading, and assistance to students. The field of education is also witnessing an increasing use of AI; however, its scope and related challenges remain unclear. The benefits of AI in education include greater flexibility in terms of time and space and a changing role of the tutor as a facilitator. We also discussed key challenges including ethical issues such as data privacy, lack of inclusion and equity for students of all backgrounds, and lack of human touch. Based on these themes we concluded that AI's role in education will increase in the future, but the challenges also need to be addressed to fully unlock the benefits of AI in the education field. Artificial Intelligence (AI) has the capacity to fundamentally alter the educational system by boosting productivity, encouraging student participation, and enabling more adaptable and individualized instruction. The potential benefits of AI and resolving related issues are a better future for education. AI has various educational applications; chatbots, learning analytics, and intelligent tutoring systems are just a few. AI is driven by natural language processing and machine learning. This study provides a comprehensive analysis of the use of AI in education, highlighting its definition, advantages, disadvantages, and possible uses. The report identifies several key advantages, such as data-driven decision-making, efficient administration, and personalized learning opportunities. However, the study also draws attention to several disadvantages, including concerns about data privacy, ethical dilemmas, and the potential replacement of human educators. In terms of the future, the research sees a bright future for artificial intelligence in education, with possible advancements in virtual reality integration, adaptive learning systems, and universal access to high-quality education. These developments have the power to improve learning outcomes and change the face of education. The study also provides a thorough knowledge of AI's impact on education, highlighting the transformative potential and promoting the ethical and responsible integration of AI.

Keywords: Artificial Intelligence, Education, Advantages, Disadvantages, Future Prospects

Introduction

AI has been integrated into nearly every aspect of modern life, revolutionizing industries and altering social norms in a time of fast technological growth. "When it comes to education, AI technologies are powerful and well-suited to the enrichment of educational objectives. Indeed, the past two decades have seen considerable AI advances in education. As will be discussed, this progress brings opportunities for enhancing teaching and learning efficiency and effectiveness; preparing students for the AI world of work; enhancing student support; improving teacher, faculty, and staff support; streamlining administration in schools, universities, and colleges; and providing education for masses. As with every development, concerns about and challenges in all of these areas are inevitable, and we shall address these, too" (Taneri, 2020).

"As an emerging field of expertise, educational AI has the potential to transform our practices and the experiences of our students" (Bates et al., 2020). The education sector is one of those seeing a significant impact. The way knowledge is shared, gained, and managed within the revered walls of academia has the potential to be completely transformed by the fusion of AI technologies and pedagogical practices. As AI becomes more popular, academic institutions

and educators must balance the promise of exceptional innovation with the difficulty of navigating new ethical and pedagogical waters.

Education has the power to influence lives and can help students get ready for a bright future. Despite their effectiveness, traditional teaching approaches frequently have trouble meeting the varied requirements and learning styles of their students. Administrative demands also make it difficult for teachers to truly engage with students, sustaining a one-size-fits-all philosophy. In this context, the fusion of artificial intelligence with education becomes a brilliant example of innovation. "One of AI's advantages: AI, deep learning, machine learning, and neural networks represent incredibly exciting and powerful machine learning-based techniques used to solve many real-world the other hand, some disadvantages are also there". (Alfarsi et al., n.d.).

One of the primary factors of AI integration in education is the promise of personalized learning experiences. AI algorithms may analyze each student's learning profile to determine their strengths, limitations, and preferred learning modalities. These algorithms are powered by data analytics and machine learning. This gives teachers the ability to customize their educational materials and methods, increasing engagement and advancing mastery.

AI is becoming a powerful force that is changing education and providing fresh approaches to enduring problems. The learning process takes on a dynamic and transformative quality when artificial intelligence is integrated into educational environments. The three fundamental objectives that this research tackles as it sets out on a thorough investigation of the objectives are, 1) what is the meaning of AI in education, 2) what advantages and disadvantages arise from AI integration in education, 3) what are the future prospects of AI in education.

Rationale of the Study

The study " Artificial Intelligence in Education: Exploring Benefits, Limitations, and Prospects" is essential because it can educate and direct important parties involved in the education industry. This study tackles important issues about the use of AI in education and provides information that could significantly alter the field of education. Here are some salient features of its applicability:

- **Educational Innovation:** The study highlights the creative ways that AI might improve education in a world that is changing quickly. It demonstrates how AI can be used to improve teaching and learning, giving teachers useful knowledge to modify their methods.
- **Improving Student Outcomes:** Improving student learning and performance requires an understanding of the benefits of artificial intelligence in education. Better educational outcomes may result from data-driven decision-making and personalized learning experiences.
- **Efficiency and Resource Optimisation:** The study emphasizes how AI can simplify administrative duties, freeing up resources for educational institutions to allocate more effectively and concentrate on their primary goal of teaching students.
- **Future-Readiness:** As the labour market changes, the study's findings about AI's role in education help students get ready for the workplace of the future, where flexibility, digital literacy, and lifelong learning will be crucial.
- **Tradition and Innovation in Education:** The study promotes a well-rounded approach to education in which the advantages of artificial intelligence are used to complement Rather Than Completely Substitute Conventional Teaching Techniques.

Method

The present study employs a conceptual framework to examine the benefits, drawbacks, and potential outcomes of integrating AI into education. As research approaches, this study makes a comprehensive survey of the literature, a critical review of the most recent scholarly works, expert opinions, and well- established frameworks in the field of AI in education.

Results and Discussions

The results of the present study are presented objective-wise as below:

Objective No-1: Meaning of AI

"In the 1950s Allen Turning proposed a solution to the question of when a system designed by a human is 'intelligent' Turing proposed the imitation game, a test that involves the capacity of a human listener to make the distinction between a conversation with a machine or another human; if the distinction is not detected, we can admit that we have an intelligence system or artificial intelligence" (Popenici & Kerr, 2017). AI is defined as "computers that can perform cognitive tasks that are normally associated with human minds" (Majid, 2022). "Computers that perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving" (Baker et al., 2019). The simulation of human intelligence in robots that are designed to think and learn like humans is known as artificial intelligence or AI. The goal of this multidisciplinary area of computer science is to develop intelligent systems that are able to carry out tasks that normally call for human intelligence. These include solving problems, identifying patterns, comprehending spoken language, drawing lessons from past experiences, and making judgments. Simple rule-based systems extremely sophisticated neural networks and machine learning algorithms are two examples of AI systems. Several popular AI methods and ideas include- Machine Learning, Natural Language Processing (NLP), Computer Vision, Robotics, Neural Networks, and Reinforcement Learning, etc.

AI in Education

"The introduction of AI into educational contexts may be traced to the 1970s" (Miao et al., n.d.). "AIED includes everything from AI-driven, step-by-step personalized instructional and dialogue systems, through AI-supported exploratory learning, the analysis of student writing, intelligent agents in game-based environments, and student-support chatbots, to AI-facilitated student/tutor matching that puts students firmly in control of their learning. It also includes students interacting one-to-one with computers, whole- school approaches, students using mobile phones outside the classroom, and much more besides. In addition, AIED can also shine a light on learning and educational practices" (Holmes et al., 2019). "Since those beginnings, the application of AI in education has developed in multiple directions, beginning with student-facing AI (tools designed to support learning and assessment) to also include teacher-facing AI (designed to support teaching) and system-facing AI (designed to support the management of educational institutions)" (Miao et al., n.d.). AIEd is a field that explores learning in various settings, including traditional classrooms and workplaces, facilitating both formal education and lifelong learning. It is the combination of different learning sciences like linguistics, neuroscience, psychology, sociology, education, and anthropology that promotes the development of adaptive learning environments and other AIEd tools that are flexible, inclusive, personalized, engaging, and effective.

Artificial intelligence refers to the "simulation of human cognitive processes" (Meinhart, 1966). through computer technology. These comprise "human cognitive abilities" (Stantion, 1995). like learning, reasoning, solving problems, and making decisions. AI systems are being utilized to develop creative solutions that optimize educational processes and reimagine conventional teaching approaches, from personalized learning pathways to administrative automation. By utilizing the strength of data-driven insights, adaptability, and automation, artificial intelligence in higher education fundamentally seeks to enhance human skills and learning outcomes. The incorporation of AI emerges as a transformational force, offering a future where learning is more personalized, efficient, and adaptive than ever before, as institutions work to meet the different requirements of students and negotiate the obstacles of modern education. Some AI tools in education are:

- **Platforms for Personalised Learning**: AI-powered systems such as Coursera, edX, and Knewton employ algorithms to tailor tests and course material to each student, taking into account their unique requirements and development.
- **Intelligent Tutoring Systems**: These programs, which include DreamBox and Carnegie

Learning, provide students in science and math classes with individualized instruction and feedback.

- **Chatbots and Virtual Assistants:** Blackboard's Ally and IBM's Watson Assistant are examples of virtual assistants that offer round-the-clock assistance to students by responding to inquiries, supplying course materials, and helping with administrative duties.
- **Plagiarism Detection**: Turnitin and Grammarly are two examples of tools that employ AI to detect and stop plagiarism in student papers and assignments.
- **Language Learning Apps**: Using AI, apps such as Duolingo and Babbel customize language learning sessions and modify content according to user performance.
- **Virtual Labs**: Labster and other virtual labs allow students to conduct experiments in a virtual setting, boosting hands-on learning in scientific and engineering education.
- **Automated Essay Scoring**: By evaluating and scoring written assignments, AI-based essay grading systems, like ETS's e-rater, save instructors' time.
- **Campus Security**: By using facial recognition technology, predictive policing algorithms, and CCTV camera monitoring, artificial intelligence can improve campus security.
- **Career Services**: Using AI tools such as Handshake, students can locate internship and work prospects that align with their aspirations and skill sets.
- **Adaptive Assessment Platforms**: Personalised learning is made possible by AI-driven assessment platforms such as ALEKS, which may adapt to the pupils' skill levels.
- **Natural Language Processing for Language Instruction**: Two AI-powered language learning programs that help users become more fluent in the language are Rosetta Stone and Babbel.

In education, these AI technologies are always growing and changing, assisting organizations, faculty, and students in improving results, streamlining procedures, and adjusting to the ever-changing nature of the educational landscape.

Objective No-2: Advantages of AI in Education

"The benefits of artificial intelligence are incredible" (Chhaya et al., 2020). AI in education has the potential to yield a multitude of advantageous outcomes that can considerably improve the educational process, instructional strategies, administrative effectiveness, and final student outcomes. Understanding the revolutionary influence that AI can have on education institutions and their stakeholders depends on exploring these benefits that are given below:

- **Finished tasks faster than a human** (Chhaya et al., 2020)**:** AI can complete some jobs more quickly than humans in the setting of education.
- **Advanced personalized learning:** AI algorithms are going to get increasingly more advanced, allowing personalized learning experiences based on student data and performance.
- **Adaptive Tests**: AI may be used to design adaptive tests that modify the level of difficulty of the questions based on the performance of the student, giving a more precise indication of their knowledge and skills.
- **Gamification and Engagement:** AI-driven gamification components can increase learning enjoyment and engagement, encouraging students to take part actively and maintain their attention on their studies.
- **Support for Faculty:** AI systems can support professors with their teaching and research activities, assisting them in staying current on new advancements in their field and enhancing their overall productivity.
- **Real-time Feedback:** AI can provide pupils with instant feedback on their homework, essays, and projects, assisting them in identifying their errors and continuously improving their work.
- **Predictive Admissions:** AI can assist colleges in identifying students who are likely to

succeed based on their academic background and other variables, which can help with scholarship distribution and admissions.

- **Virtual Laboratories:** AI-powered virtual laboratories and simulations enable students to conduct experiments and simulations in a controlled environment, which is particularly advantageous for scientific and engineering programs.
- **Social and Emotional Well-being**: AI can promote social and emotional learning by monitoring and enhancing students' well-being in these areas and, as needed, offering resources and help for mental health.
- **Alumni Engagement:** By recommending customized engagement options, events, and donation opportunities, AI may assist colleges in maintaining links with their alumni.
- **Language Learning:** Platforms that use AI to drive language learning can give immersive language training while also providing feedback on pronunciation, real-world context, and cultural insights.
- **Plagiarism Detection:** By spotting instances of plagiarism in student assignments and research papers, AI-based plagiarism detection programs can assist institutions in upholding academic integrity.
- **Accessible Features:** To serve students with different needs, AI may provide alt-text for images, transcripts for films, and other accessible features.
- **Research in Education:** AI can help researchers analyse educational data, run experiments, and acquire insights on productive teaching and learning techniques.
- **Delivery of Adaptive Content:** Based on student performance, AI may modify the pace and challenge of a course's content in real-time, ensuring that every student has the best possible learning experience.
- **24/7 Support** (Dewangan, n.d.): AI-powered virtual assistants and chatbots may interact with students 24/7, answering their questions, giving them information, and helping them succeed academically.
- **Teacher Assistance:** "Educational tools, particularly those geared toward artificial intelligence, are now available to help college students with math, writing, and other subjects" (Salau et al., 2022).
- **Benefits of AI-driven Programs:** "AI can give feedback on the overall effectiveness of the classes in addition to assisting teachers and students in developing lessons that are tailored to each individual's needs. Some universities, especially those that offer internet services, use AI systems to monitor student progress and notify instructors/teachers when a problem arises with their students' performance" (Salau et al., 2022).

Disadvantages of AI in Education
With its cutting-edge tools and solutions that increase learning, simplify administrative work, and enhance the entire educational experience, AI has fundamentally changed education. "Despite the huge opportunities AI offers there might also be some potential risks with it" (Kengam, 2020). The following are some disadvantages of AI in education:

- **Costs:** Putting AI technologies into place can be costly. Budgetary constraints may arise when institutions have to make investments in employee training, software, and infrastructure.
- **Data Privacy:** The gathering and analysis of student data by AI systems raises concerns about data security and privacy. Important student information must be protected, and infractions may result in serious consequences.
- **Ethical Concerns:** Unintentionally reinforcing biases present in the data that artificial intelligence programs are trained on can happen, which could result in biased decisions being made in areas like admissions, grading, or recommendation systems.
- **Depersonalization:** Although AI can personalize learning experiences, it can also result in

a depersonalized education, where students have little opportunity to engage with classmates and teachers, which is crucial for the development of the whole person.

- **Displacement of Jobs:** There are worries that AI could displace some jobs in higher education, including some teaching activities and administrative jobs like clerks.
- **Technical Difficulties:** AI systems need upkeep, updates, and technical assistance. System malfunctions or technical issues can obstruct learning.
- **Lack of Human Touch:** Some students might be missing out on the human touch in education, such as in-person contact with classmates, mentors, and professors, which AI-driven online courses might not fully supply.
- **Limited Creativity and Critical Thinking:** AI may struggle to inspire creativity, critical thinking, and open-ended dialogues, which are crucial in higher education. AI can thrive at providing factual information and assessments, though.
- **Accessibility Problems:** Due to unequal access to technology and the internet, some students may not be able to make full use of AI-powered instructional tools.
- **Overreliance on Technology:** Teachers will become overly dependent on automated tools and lose part of their teaching abilities due to an overreliance on AI.
- **Resistance to Change:** Teachers and students who are accustomed to traditional teaching methods may be resistant to AI utilization in education.
- **Quality Content Issues:** Difficult to ensure the quality of AI-generated content because it may lack the depth and nuance of information that is authored by humans, such as automated essays or course materials.
- **Bias and Justice:** AI systems may unintentionally reinforce educational biases that favour particular groups or demographics, undermining justice and equity.
- **Complexity:** Understanding and administering AI systems are challenging, and teachers may need training to employ these resources efficiently, which may require time.
- **Loss of Student Autonomy:** If AI is used excessively for decision-making, students' autonomy and capacity to make decisions about their education may be constrained.

Institutions should carefully implement AI systems, guarantee transparency and fairness in AI algorithms, prioritize data privacy and security, and offer ongoing training and support for teachers and students to maximize the benefits of AI in education while mitigating these drawbacks. To guarantee that AI solutions are beneficial to all stakeholders, ethical considerations should govern their development and implementation.

Objective No-3: Future Prospects of AI in Education

"Technological advances have opened a world of opportunities for students and teachers lately. With new access to online and traditional learning platforms, the possibilities for furthering educational goals seem limitless" (Escotet, 2023). The potential for AI in education to revolutionize several facets of the educational system is bright. AI in higher education has bright prospects and is expected to have a big impact from many perspectives. Some of the prospects of AI in education include:

- **Innovator's Viewpoint**: From the standpoint of entrepreneurs and innovators in the ed-tech sector, AI represents a substantial market potential. They see AI as a vehicle to upend established educational paradigms, presenting fresh approaches and platforms that can accommodate institutions' and students' changing requirements.
- **Student's Viewpoint:** A lot of students see AI as a mixed gift. On the one hand, they value the accessibility and personalized learning opportunities that AI can offer. The overuse of AI, on the other hand, has raised concerns that it may depersonalize education and diminish the importance of human mentors and teachers.
- **Teacher's Viewpoint:** Teachers frequently hold a cautiously upbeat view of artificial intelligence. Some educators are concerned about job displacement or a decline in

educational quality if AI is not applied properly, even though they acknowledge the potential for AI to enhance teaching through personalized help and automated grading. They also stress that instructors' roles should be enhanced by AI rather than replaced.

- **Administrator's Viewpoint**: The efficacy and economic advantages of AI are regularly emphasized by the university administration. They see AI as a way to streamline administrative processes, reduce costs, and allocate resources more effectively, allowing schools to operate more efficiently and perhaps charge students less.
- **Researcher's Viewpoint:** Academics working in the fields of AI and education perceive a chance to advance the study of learning. They are enthusiastic about the possibility that AI will produce new teaching approaches and a greater comprehension of human cognition revealing the most effective ways for children to learn best.
- **Technologist's Viewpoint:** Researchers working on cutting-edge AI applications see higher education as a fertile testing ground. They are enthusiastic about pushing the limits of AI to create innovative methods and tools for education that can be used in other fields as well.
- **Perspective of Regulation and Policy:** Data privacy, algorithmic prejudice, and the possibility of surveillance in educational settings are among the concerns of policymakers and regulators. They emphasize the necessity for precise laws and policies to guarantee the ethical application of AI in education.
- **Interdisciplinary Perspective:** Interdisciplinary researchers and educators are aware of how AI has the potential to connect disparate fields of study and disciplines. AI can encourage innovative curriculum creation and collaboration between many academic areas.
- **Sustainability Perspective:** Those who support sustainability can see AI as a means to lessen education's environmental impact. AI can help promote more environmentally friendly educational practices by enabling remote learning and lowering the requirement for physical resources.
- **The Broad Picture:** AI can reduce the educational gap that exists between industrialized and developing countries. AI-powered online learning can democratize access to education by providing first-rate resources to underprivileged and rural areas

There are a variety of chances for improved learning experiences, administrative efficiency, increased access, data-driven decision-making, research, skill development, and international collaboration offered by AI's prospects in higher education. But for AI to completely realize its promise in higher education, it must carefully manage the ethical, financial, and privacy issues that go along with these opportunities.

Conclusion

This in-depth investigation of the use of AI in education puts into stark relief the complex dynamics and potential transformation of the educational environment. The use of AI in education has many advantages, including advanced personalized learning, adaptive tests, gamification and engagements, real-time feedback, and increased accessibility. However, it presents many disadvantages including data privacy, ethical concerns, depersonalization, and displacement of jobs. With immersive learning environments and a variety of learning tools, AI revolutionizes education and offers prospects for upskilling and reskilling. To properly create the future of higher education, collaboration between administrators, educators, researchers, and students is crucial. In conclusion, this study provides a comprehensive viewpoint on AI integration in education that is enlightened by its potential, informed by its difficulties, and motivated by its promises. The path ahead calls for deliberate innovation, moral stewardship, and an unrelenting dedication to giving each person the chance to develop personally. With AI as its painter, education's future holds the possibility of a more open, fair, and progressive learning environment.

References

1. Alfarsi, G., Tawafak, R. M., Eldow, A., Malik, S. I., Jabbar, J., Al Sideiri, A., & Mathew, R. (n.d.). General View about an Artificial Intelligence Technology in Education Domain. https://doi.org/10.5220/0010304500003051

2. Baker, T., Smith with Nandra Anissa, L., Sheehan, K., Ward, K., Waters, A.,

3. Cinnamon, J., Copeland, E., Duffy, E., Hannon, C., John, J., Grant, J., Klinger, J.,

4. Latham, M., Macken, C. Ward-Dyer, G. (2019). Educ-AI-tion Rebooted?

5. Exploring the future of artificial intelligence in schools and colleges. www.nesta.org.uk

6. Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? In International Journal of Educational Technology in Higher Education (Vol. 17, Issue 1). Springer. https://doi.org/10.1186/s41239-020-00218-x

7. Chhaya, K., Khanzode, A., & Sarode, R. D. (2020). Advantages and disadvantages of artificial intelligence and machine learning: a literature review. 9–10. http://www.iaeme.com/IJLIS/index.asp30http://www.iaeme.com/IJLIS/issues.asp?JType=IJLIS&VT ype=9&IType=1JournalImpactFactor

8. Dewangan, A. (n.d.). Artificial intelligence (AI): A Privilege or A Disadvantage. https://ssrn.com/abstract=4442456

9. Escotet, M. Á. (2023). The optimistic future of Artificial Intelligence in higher education. Prospects. https://doi.org/10.1007/s11125-023-09642-z

10. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education. Promise and Implications for Teaching and Learning. https://www.researchgate.net/publication/332180327

11. Kengam, J. (2020). Artificial intelligence in education. https://doi.org/10.13140/RG.2.2.16375.65445

12. Majid, I. (2022). Artificial intelligence in education. In The Indian Journal of Technical Education (Vol. 45).

13. Meinhart, W. A. (1966). Artificial Intelligence, Computer Simulation of Human Cognitive and Social Processes, and Management Thought. In Source: The Academy of Management Journal (Vol. 9, Issue 4). https://www.jstor.org/stable/254948?seq=1&cid=pdf-

14. Miao, Fengchun., Holmes, Wayne., Huang, Ronghuai., Zhang, Hui., & Unesco. (n.d.). AI and education: Guidance for policymakers.

15. Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. Research and Practice in Technology Enhanced Learning, 12(1). https://doi.org/10.1186/s41039-017-0062-8

16. Salau, A., Demilie, W. B., Akindadelo, A., Nnenna, E. J., Salau, A. O., Akindadelo, A. T., & Eneh, J.

17. N. (2022). Artificial Intelligence Technologies: Applications, Threats, and Future Opportunities Data Security in WSN View project design and implementing direct torque control of induction motor using TMDSHVMTRPFCKIT dsp View project Artificial Intelligence Technologies: Applications, Threats, and Future Opportunities. https://www.researchgate.net/publication/365715182

18. Stantion, N. (1995). Human Cognitive Abilities: A Survey of Factor-Analytic Studies, by J. B. Carroll, Cambridge University Press, Cambridge (1993), pp. iv + 819, ISBN 0-521-38712-4. Ergonomics, 38(5), 1074–1074. https://doi.org/10.1080/00140139508925174

19. Taneri, G. U. (2020). Towards Customized Teaching and Learning, and Skills for an AI World of Work.