



Artificial Intelligence in Education: An Overview

Zulkifli Ahmad¹, Saiful Latif²

¹ Program studi Pendidikan Biologi, FKIP, Universtas Khairun, Indonesia

² Program studi Pendidikan Bahasa Inggris, FKIP, Universtas Khairun, Indonesia

Email: zul_bio@unkhair.ac.id; saifullatif203@gmail.com

Introduction

Artificial intelligence is rapidly transforming various sectors, and education is no exception, with the potential to revolutionize teaching, learning, and administration. The development of AI in recent years has opened up many opportunities for education (Yang et al., 2023). AI offers the ability to solve complex problems, making it an important field to study and apply because its capacity to learn is similar to the neural network of the human brain (Raup et al., 2022). AI in education encompasses a wide range of methods, capabilities, and limitations, which are often not well defined by academics, educational technology companies, and AI developers (Gillani et al., 2023). The field of education is constantly changing to accommodate the educational needs of the new generation, and the advent of AI represents perhaps the fastest rate of educational change (Garcia-Martinez et al., 2023).

The Role of AI in Modern Education

AI offers the potential to transform teaching approaches by developing more engaging and responsive learning environments, potentially enhancing traditional educational strategies. The growing interest in AI stems from its transformative capabilities in a variety of industries and everyday contexts, reflected in the growing demand for AI education from students from a variety of academic backgrounds. AI-enabled educational tools provide a tailored learning experience that meets the specific needs of each student, allowing students to learn at their own pace and in the way that is most effective for them (Z. Ahmad et al., 2024; Owusu et al., 2024). AI can automate administrative activities so educators can focus more on student engagement and curriculum development (Pahi et al., 2024). AI enhances educational tools by personalizing learning, increasing engagement, assisting instructors, and offering accessible education to all students (H. Ahmad et al., 2018; Dey, 2024). However, effective implementation of AI in education requires careful consideration, planning, and implementation to address potential challenges and maximize its benefits.



Benefits of AI in Education

AI is revolutionizing education by enhancing learning experiences, changing teaching methodologies, and optimizing administrative processes (Onesi-Ozigagun et al., 2024). AI-powered systems can optimize processes such as student enrollment, scheduling, and resource allocation, leading to more efficient and effective management of educational institutions (Onesi-Ozigagun et al., 2024). AI has made substantial progress in the educational context since the 1970s, when it first appeared in the form of tools designed to assist learning, teaching, and administration of educational institutions (Otero et al., 2023). AI automates administrative activities and customizes learning experiences, which can help educators spend more time interacting with students and developing curriculum (Heeg & Avraamidou, 2023; Onesi-Ozigagun et al., 2024). By evaluating extensive data sets, AI algorithms offer educational content and experiences tailored to each student's needs while enabling educators to streamline administrative tasks and provide timely interventions (Leon Jr, 2024). AI enhances educational tools by personalizing learning, increasing engagement, assisting instructors, and offering accessible education to all students (Dey, 2024). AI can provide feedback on student performance, highlight areas for improvement, and ensure inclusivity for students with special needs or language barriers (Lampou, 2023). AI's ability to offer customized learning experiences, increase educational accessibility, and enhance teaching effectiveness has demonstrated the technology's revolutionary impact on the education sector (Bit et al., 2024).

AI-Based Personal Learning

AI-based personalized learning systems analyze student data to create a customized learning experience for each student, allowing them to learn more efficiently using less time and resources than traditional teaching methods (Lin et al., 2023; Quintero et al., 2019). By examining student data and academic records, AI algorithms can detect learning gaps and offer targeted support and interventions. The system evaluates each student's performance, strengths, and weaknesses to provide a personalized learning program (Kamalov et al., 2023). AI algorithms analyze vast data sets to tailor educational content and experiences to each student's needs, while empowering educators to streamline administrative tasks and provide timely interventions (Leon Jr, 2024). By analyzing student data and behavior, AI algorithms can identify patterns and predict student performance, allowing educators to intervene early and offer personalized support to struggling students (Lin et al., 2023). AI can enhance personalized learning by assessing students' interactions with e-learning resources and determining their learning styles or areas of difficulty (Jian, 2023). AI's ability to deliver personalized learning experiences, increase educational accessibility, and enhance teaching effectiveness demonstrates the technology's revolutionary impact on the education sector (Ayani et al., 2024; Maghsudi et al., 2021).



Challenges and Considerations for AI in Education

The integration of AI in education presents significant challenges and considerations that must be addressed to ensure ethical, equitable, and effective implementation. ("Global Education Studies Review," 2020). AI-based education raises concerns about data privacy and security, as these systems rely on the collection and analysis of large amounts of student data (Karpouzis, 2024). It is critical to protect sensitive information. AI system algorithms can inadvertently perpetuate or reinforce biases that lead to unfair or discriminatory outcomes. Algorithmic bias and the opacity of AI decision-making processes pose risks that perpetuate inequities and influence assessment outcomes (Bulut et al., 2024). To ensure responsibility and fairness, transparency and accountability in AI systems are essential.

It is critical to address ethical issues related to data privacy, algorithmic bias, and equitable access to realize the full transformative potential of AI in education. Bias, lack of trust, high costs, privacy, and security concerns are some of the issues that must be addressed when using AI in education (Akgun & Greenhow, 2022; Harry & Sayudin, 2023). Additionally, the reliability and maintainability of AI systems are important considerations, as heavy reliance on these systems for educational tasks may raise concerns about their long-term viability (Al-Zahrani, 2024). AI presents additional challenges, including concerns about ethics, student privacy, inaccuracy, plagiarism, over-reliance on technology, and the need to maintain human interaction in educational settings (Delello et al., 2025).

To fully realize the transformative potential of AI in education, it is important to address ethical issues related to data privacy, algorithmic bias, and equitable access (Akgun & Greenhow, 2022; Bulut et al., 2024; Lin et al., 2023). Educators and students must receive adequate training and support to use AI technologies effectively, and institutions must address the issue of inequitable access to digital resources. AI can advance or hinder educational standards depending on how it is implemented, so it is important to understand these complexities to guide the development of efficient strategies and policies that maximize AI's potential while minimizing its limitations (Ajani et al., 2024). AI raises concerns about data privacy and the potential to reinforce existing gaps in the education sector (Roshanaei et al., 2023). It is critical to ensure that AI systems are impartial and do not reinforce existing inequalities, and institutions must ensure this (Harry & Sayudin, 2023).

There is a need to develop strategies for the responsible use of generative AI, ensuring that both teachers and students can benefit from its capabilities without compromising academic integrity (Cordero et al., 2024). Therefore, to reduce these risks, the European Commission has published a set of ethical guidelines for teachers and school leaders to effectively integrate AI technology and data into school education and raise awareness of its potential threats (Klimova et al., 2023). The ethical use of AI and data in learning, teaching, and assessment is based on four key ethical considerations: human action, justice, humanity,



and justifiable choice (Chaudhary, 2019; Klimova et al., 2023). New competencies for educators for the ethical use of AI and data technologies for educational purposes are being developed, such as being able to critically describe the positive and negative impacts of the use of AI and data in education or being able to understand the basics of AI and learning analytics (Klimova et al., 2023). It is important to deepen reflection on the transparency of the decision-making process of AI systems that broadens the discussion on ethical issues related to the large-scale collection of student data (Gentile et al., 2023; Pitrella et al., 2023).

Conclusion

In conclusion, to ensure the successful and ethical integration of AI in education, stakeholders must work together to develop comprehensive strategies, address ethical issues, and prioritize equitable access and responsible implementation.

REFERENCE

- Ahmad, H., Ahmad, Z., & Sudiono, S. (2018). IT Capability Mapping on Biological Students in the Industrial Revolution Era 4.0. *Proceedings of the 1st International Conference on Teaching and Learning*, 269–273. <https://doi.org/10.5220/0008900702690273>
- Ahmad, Z., Gani, H. A., & Haling, A. (2024). Analysis of the Need for Virtual Reality Learning Media in Animal Developmental Structure Courses. *Proceedings of International Conference on Education*, 2(1), 430–436. <https://doi.org/10.32672/pice.v2i1.1391>
- Ajani, O. A., Akintolu, M., & Afolabi, S. O. (2024). The emergence of artificial intelligence in the higher education: Prospects and challenges of AI. *International Journal of Research in Business & Social Science*, 13(8).
- Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics*, 2(3), 431–440.
- Al-Zahrani, A. M. (2024). Unveiling the shadows: Beyond the hype of AI in education. *Heliyon*, 10(9).
- Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, 18(2), 261–271.
- Bit, D., Biswas, S., & Nag, M. (2024). The impact of artificial intelligence in educational system. *Indo Am. J. Pharm. Res*, 11, 419–427.
- Bulut, O., Beiting-Parrish, M., Casabianca, J. M., Slater, S. C., Jiao, H., Song, D., Ormerod, C. M., Fabiyi, D. G., Ivan, R., Walsh, C., & others. (2024). The rise of artificial intelligence in educational measurement: Opportunities and ethical challenges. *ArXiv Preprint ArXiv:2406.18900*.
- Chaudhary, M. Y. (2019). Augmented Reality, Artificial Intelligence, and the Re-enchantment of the World. *Zygon*, 54(2), 454–478. <https://doi.org/10.1111/zygo.12521>
- Cordero, J., Torres-Zambrano, J., & Cordero-Castillo, A. (2024). Integration of Generative Artificial Intelligence in Higher Education: Best Practices. *Education Sciences*, 15(1), 32.



- Delello, J. A., Sung, W., Mokhtari, K., Hebert, J., Bronson, A., & De Giuseppe, T. (2025). AI in the Classroom: Insights from Educators on Usage, Challenges, and Mental Health. *Education Sciences*, 15(2), 113.
- Dey, D. N. C. (2024). Enhancing Educational Tools Through Artificial Intelligence in Perspective of Need of AI. *Available at SSRN 5031275*.
- Garcia-Martinez, I., Fernández-Batanero, J. M., Fernández-Cerero, J., & León, S. P. (2023). Analysing the impact of artificial intelligence and computational sciences on student performance: Systematic review and meta-analysis. *Journal of New Approaches in Educational Research*, 12(1), 171–197.
- Gentile, M., Città, G., Perna, S., & Allegra, M. (2023). Do we still need teachers? Navigating the paradigm shift of the teacher's role in the AI era. *Frontiers in Education*, 8, 1161777.
- Gillani, N., Eynon, R., Chiabaut, C., & Finkel, K. (2023). Unpacking the “Black Box” of AI in education. *Educational Technology & Society*, 26(1), 99–111.
- Harry, A., & Sayudin, S. (2023). Role of AI in Education. *Interdisciplinary Journal & Hummanity (INJURITY)*, 2(3).
- Heeg, D. M., & Avraamidou, L. (2023). The use of Artificial intelligence in school science: a systematic literature review. *Educational Media International*, 60(2), 125–150.
- Jian, M. J. K. O. (2023). Personalized learning through AI. *Advances in Engineering Innovation*, 5, 16–19.
- Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (2023). New era of artificial intelligence in education: Towards a sustainable multifaceted revolution. *Sustainability*, 15(16), 12451.
- Karpouzis, K. (2024). Artificial Intelligence in Education: Ethical Considerations and Insights from Ancient Greek Philosophy. *Proceedings of the 13th Hellenic Conference on Artificial Intelligence*, 1–7.
- Klimova, B., Pikhart, M., & Kacetl, J. (2023). Ethical issues of the use of AI-driven mobile apps for education. *Frontiers in Public Health*, 10, 1118116.
- Lampou, R. (2023). The integration of artificial intelligence in education: Opportunities and challenges. *Review of Artificial Intelligence in Education*, 4, e15–e15.
- Leon Jr, C. (2024). Education and Artificial Intelligence: Revolutionizing Learning as a Unique Tandem. *Available at SSRN 4721768*.
- Lin, C.-C., Huang, A. Y. Q., & Lu, O. H. T. (2023). Artificial intelligence in intelligent tutoring systems toward sustainable education: a systematic review. *Smart Learning Environments*, 10(1), 41.
- Maghsudi, S., Lan, A., Xu, J., & van der Schaar, M. (2021). Personalized Education in the Artificial Intelligence Era: What to Expect Next. *IEEE Signal Processing Magazine*, 38(3), 37–50.
<https://doi.org/10.1109/MSP.2021.3055032>
- Onesi-Ozigagun, O., Ololade, Y. J., Eyo-Udo, N. L., & Ogundipe, D. O. (2024). Revolutionizing Education Through AI: A Comprehensive Review of Enhanced Learning Experiences. *International Journal of Applied Research in Social Sciences*, 6(4), 589.
- Otero, L. C., Català, A., Fernández-Morante, C., Taboada, M., López, B. C., & Barro, S. (2023). AI literacy in K-12: a systematic literature review. *International Journal of STEM Education*, 10(1).
<https://doi.org/https://doi.org/10.1186/s40594-023-00418-7>



- Owusu, S. K., Zimpa, J. B., Atta, F. A., & Darling, M. (2024). Evaluating the Impact of AI Personalized Learning System in Higher Education; Examining How it Affects Academic Achievement Across Different Age Groups at Kumasi Technical University. *Journal of Artificial Intelligence Machine Learning and Neural Networks*, 45(19).
- Pahi, K., Hawlader, S., Hicks, E., Zaman, A., & Phan, V. (2024). Enhancing active learning through collaboration between human teachers and generative AI. *Computers and Education Open*, 6(100183). <https://doi.org/https://doi.org/10.1016/j.caeo.2024.100183>
- Pitrella, V., Perna, S., Allegra, M., Gentile, M., Ottaviano, S., Re, A., Tosto, C., & Città, G. (2023). Artificial intelligence for personalized learning in K-12 education. a scoping review. *International Conference on Higher Education Learning Methodologies and Technologies Online*, 372–382.
- Quintero, J., Baldiris, S., Rubira, R., Cerón, J., & Velez, G. (2019). Augmented reality in educational inclusion. A systematic review on the last decade. *Frontiers in Psychology*, 10(AUG), 1–14. <https://doi.org/10.3389/fpsyg.2019.01835>
- Raup, A., Ridwan, W., Khoeriyah, Y., Supiana, S., & Zaqiah, Q. Y. (2022). Deep Learning and Its Application in Learning. *JIIIP - Scientific Journal of Educational Sciences*, 5(9), 3258. <https://doi.org/https://doi.org/10.54371/jiip.v5i9.805>
- Roshanaei, M., Olivares, H., & Lopez, R. R. (2023). Leveraging AI to Promote Equity in Education: Opportunities, Challenges, and Emerging Strategies. *Journal of Intelligent Learning Systems and Applications*, 15(4), 123. <https://doi.org/https://doi.org/10.4236/jilsa.2023.154009>
- Yang, Q., Lian, L.-W., & Zhao, J. (2023). Developing a gamified artificial intelligence educational robot to enhance learning effectiveness and behavior in a laboratory safety course for undergraduate students. *International Journal of Educational Technology in Higher Education*, 20(1). <https://doi.org/https://doi.org/10.1186/s41239-023-00391-9>