JOURNAL OF EDUCATION AND APPLIED TEACHING (JEAT)
Volume 2 Nomor 3, 2026, 1157-1165
E-ISSN: 3090-0360

The Role of AI in Educational Transformation in the Digital Era of the 21st Century

Rahmattulah[1]
[1]*Universitas PGRI Palembang*
**Corresponding author: rahmatulahg@gmail.com*

Abstrak

Perkembangan teknologi yang pesat, terutama kecerdasan buatan (AI), telah membawa transformasi signifikan dalam berbagai aspek kehidupan manusia, termasuk pendidikan. Tujuan utama pengembangan AI adalah untuk membantu dan menyederhanakan pekerjaan manusia daripada menggantinya. Dalam konteks pendidikan, AI memainkan peran penting dalam meningkatkan efektivitas pembelajaran, mempersonalisasi konten pembelajaran, dan memperbaiki manajemen pendidikan. Namun, keberhasilan penerapan AI sangat bergantung pada kesiapan guru, kecukupan infrastruktur, dan tingkat literasi digital masyarakat. Penelitian ini menggunakan pendekatan kualitatif berdasarkan tinjauan pustaka, dengan mengambil data sekunder dari sumber-sumber seperti buku, artikel ilmiah, jurnal nasional dan internasional, serta penelitian terkini tentang integrasi AI dalam pendidikan. Temuan menunjukkan bahwa integrasi AI ke dalam pendidikan menawarkan banyak manfaat, termasuk memfasilitasi pembelajaran yang dipersonalisasi, meningkatkan efisiensi pengajaran, mempromosikan inklusivitas, dan mempersiapkan generasi muda untuk menghadapi tuntutan era digital dan era Society 5.0. Selain itu, AI memungkinkan pembelajaran adaptif, membantu pendidik dalam penilaian, dan mendorong pengembangan kompetensi abad ke-21 seperti berpikir kritis, kreativitas, dan literasi digital di kalangan siswa.

***Kata kunci*:** *Kecerdasan Buatan, Pendidikan, Studi Sastra, Literasi Digital, Transformasi Pembelajaran.*

Abstract

The rapid advancement of technology, particularly artificial intelligence (AI), has brought about significant transformations in various aspects of human life, including education. The main objective of AI development is to assist and simplify human work rather than replace it. In the context of education, AI plays a crucial role in enhancing learning effectiveness, personalizing learning content, and improving educational management. However, the success of AI implementation greatly depends on teachers' readiness, the adequacy of infrastructure, and the community's level of digital literacy. This research utilizes a qualitative approach based on a literature review, drawing on secondary data from sources like books, scholarly articles, national and international journals, and current research on AI integration education. The findings indicate that integrating AI into education offers numerous benefits, including facilitating personalized learning, improving teaching efficiency, promoting inclusivity, and preparing the younger generation to face the demands of the digital era and the Society 5.0 age. Moreover, AI enables adaptive learning, assists educators in assessment, and fosters the development of 21st-century competencies such as critical thinking, creativity, and digital literacy among students.

Keywords: Artificial Intelligence, Education, Literature Study, Digital Literacy, Learning Transformation

1. INTRODUCTION

As technology becomes increasingly sophisticated and intelligent, humans seem to be competing with their own creations. The primary purpose of technology is to assist and ease human workloads, not to replace humans as the primary actors in various life activities. In education, the use of artificial intelligence (AI) technology is closely linked to the ability of educators to apply it to students and learners (Yani, 2024). The statement implies that technological advancement should be viewed as a tool to support and simplify human

History:
Received : 2 March 2026
Revised : 2 March 2026
Accepted : 4 March 2026
Published : 7 March 2026

Publisher: Horizon Edukasi Prima Indonesia

activities rather than replace human roles. In the educational context, the effectiveness of implementing artificial intelligence (AI) technology largely depends on educators' ability to adapt and utilize it appropriately within the learning process. Over the past few decades, artificial intelligence (AI) has advanced at a rapid pace, changing industry, healthcare, and education, among other facets of human life. AI makes it possible for computers to replicate human cognitive capacities and carry out tasks that normally demand for human intelligence. Advances in computers and data processing, which have produced complex AI systems and algorithms, are important forces behind the development of AI. AI can evaluate data, gain knowledge from experiences, and continuously improve its skills by utilizing machine learning and deep learning. (Afandi & Kurnia, 2023).

This statement confirms that artificial intelligence is developing rapidly and having a significant impact on various areas of human life. Developments in computing and data processing are key factors enabling the creation of more advanced AI systems. By utilizing machine learning and deep learning technologies, AI can interpret data, hone its capabilities over time, and make significant contributions to progress in various sectors such as industry, healthcare, and education.

Artificial intelligence, created through technological engineering, replicates human thought processes, allowing machines to execute intricate tasks autonomously and adapt to situations. In education, AI enhances learning management efficiency and personalizes content to cater to individual students' needs. By integrating AI, education can undergo a substantial shift away from traditional teaching methods. However, this also requires human resource preparedness to address potential ethical impacts and challenges. Therefore, a thorough understanding of the concepts and implementation of AI is a crucial foundation for designing modern, inclusive, and sustainable learning systems. (Syawaudin, 2025). The findings suggest that integrating artificial intelligence (AI) can significantly reshape learning systems, making them more efficient, personalized, and adaptable to individual needs. However, its successful implementation depends heavily on the readiness of human resources to understand both the concepts and possible ethical implications. Therefore, a comprehensive understanding of AI serves as an essential foundation for developing a modern, inclusive, and sustainable education system.

AI is transforming the workplace with automation, which may displace certain jobs. Additionally, the collection and analysis of large datasets by AI systems raise concerns about protecting personal data and ensuring security. Therefore, data protection policies are crucial to prevent misuse and privacy violations, including in education. (Mufakhrasiy & Adawiyah, 2025).

Furthermore, AI has a complex impact on students' learning experiences. This technology opens up opportunities for personalized learning, allowing students to tailor their learning paths to individual interests and abilities. AI also encourages the acquisition of new skills such as digital literacy and analytical skills. However, challenges such as technological dependency and data privacy issues require attention. Therefore, developing critical awareness and digital ethics is necessary so that students can utilize AI wisely and responsibly. (Nadya, 2025).

It can be inferred that artificial intelligence (AI) is a highly impactful technological advancement that has significantly influenced various aspects of human life, particularly in

education. Its rapid development not only enhances the efficiency and effectiveness of the learning process but also enables the realization of more personalized, adaptive, and learner-centered education. However, the successful implementation of AI greatly depends on the readiness of human resources, particularly educators, to understand its concepts, ethics, and potential impacts. In addition, challenges related to data security, privacy, and technological dependence require serious attention. Thus, implementing robust data protection measures and fostering critical awareness along with digital ethics are vital to guarantee that the integration of AI in education is conducted in a wise, responsible, inclusive, and sustainable manner.

2. METHOD

This research uses a qualitative approach. According to Denzin and Lincoln (1994) in Anggito and Setiawan (2018:7), A qualitative approach is research conducted in a natural context with the goal of understanding and interpreting phenomena in depth. The method used is library research, which involves collecting data through books, journals, magazines, and various scientific literature relevant to the research topic. Literature research involves reading, collecting, recording, sorting, and then organizing the acquired literature (Hanifah & Purbosari, 2022). A literature review is a type of research that involves collecting and reviewing data from sources such as journal articles, relevant books, and other sources to gather the necessary information, which will then be further analysed (Insan, 2024).

3. RESULT AND DISCUSSION

The importance of AI lies in raising public awareness of its use, implications, and potential outcomes, which can facilitate the implementation of appropriate and timely regulations. While the number of studies analyzed in this literature review is small, it summarizes empirical findings from open-access research articles in English, with a particular focus on AI and scientific writing. Furthermore, the review adds value by discussing recent studies, including the latest versions of commercially available AI tools and their ability to assist in scientific writing. One limitation is the exclusion of valuable studies on topics that are not open access.

Furthermore, the strict focus on the scientific writing process results in the neglect of studies exploring AI and academic writing in a broader context, as well as the use of AI in other academic fields (Rahayu, 2025). Recently, Indonesia has witnessed a notable increase in the incorporation of Artificial Intelligence (AI) in the education sector. Research findings consistently show that AI has a pivotal role in elevating educational standards, notably by enhancing learning processes, academic achievements, and student engagement (Rohman, et. al, 2025).

While AI can significantly aid scientific writing, students must still develop their academic skills. AI should supplement, not supplant, critical thinking and analytical capabilities. To maximize benefits, training programs are crucial to teach students how to utilize AI effectively and responsibly, thereby improving the quality of their academic work (Siagian, 2025) User readiness in adopting AI is a key factor in the successful implementation of this technology in various sectors, including education and academic administration (Yolanda in Kasman, 2025).

However, the main challenge still faced is the uneven availability of technological infrastructure. In some regions, particularly less developed ones, access to technology remains limited, hampering the optimal use of AI. This disparity in access creates a digital divide that further widens the gap between developed and underdeveloped regions in the application of intelligent technology. Furthermore, limited internet access and a lack of supporting devices are also major obstacles, resulting in limited AI utilization in certain regions.

Therefore, strategic efforts are needed to develop a more equitable technological infrastructure so that AI can be accessed and utilized by all parties in a more inclusive and equitable manner (Kasman, 2025). The role of teachers has shifted from simply conveying information to helping students become creative, critical thinkers, and develop character.

While AI takes over mechanical and repetitive tasks, teachers concentrate on the more complex and valuable aspects of human learning, such as building emotional connections, instilling values, and guiding students' character development. Technology cannot replace these aspects of learning. Teachers and AI are working together to create more effective, personalized, and modern learning systems. However, new challenges arise. Teachers must acquire better and more tailored digital skills to optimally utilize AI in the learning process. Therefore, teacher training and professional development are crucial to enable them to collaborate with AI technology and provide students with more meaningful learning experiences (Azzahra, 2025). A significant advantage of AI in education is its capacity to tailor learning approaches to suit each student's unique requirements. Through AI-based learning systems, students can learn at their own pace, receive supplemental materials as needed, and receive assistance from chatbots or virtual tutors in understanding difficult concepts (Dewi in Afrita, 2024).

The role of AI in learning transformation is personalizing learning, increasing the effectiveness of the learning process, supporting inclusivity, and preparing future generations.

1) Personalized learning means learning tailored to students' needs, pace, learning style, and interests. The goal is to make students feel more engaged, motivated, and achieve optimal learning outcomes because they don't have to adhere to a single standard (Ellikal and Rajamohan, 2024).
2) The effectiveness of the learning process refers to how well the instructional process and learning environment enable students to achieve learning goals in relatively minimal time and effort, with maximum understanding (Setyawan et al., 2024).
3) Inclusivity in education means providing access, support, and an environment that enables all students including those with special needs, diverse backgrounds, and diverse learning abilities to learn together and thrive (Hasanah, e.t al, 2024).
4) Preparing future generations means that education needs to develop skills that are relevant to global challenges: digital literacy, creativity, 21st-century skills, adaptation to change, and character and ethics in the use of technology (Edwin, Widiana, Lasmawan & Suharta, 2025).

Thus, the benefits of AI in education extend beyond classroom teaching and learning processes. It also expands opportunities for students to develop independently and assists teachers in improving the quality of teaching and evaluation. Maximizing AI utilization can create a more dynamic, adaptive, and efficient educational ecosystem, equipping the younger

generation to tackle the growing complexities of the digital age and Society 5.0 (Pratiwi in Rahmawan, 2025).

The challenges faced in implementing AI and digitalization are uneven infrastructure, many regions do not have adequate technological infrastructure, such as fast internet access, stable electricity, and quality hardware (Hermawan et al., 2024). Lack of digital literacy, many individuals, especially among the older generation or less educated people, do not have basic skills in using technology (Nawaf et al., 2023). This is a major barrier to widespread digitalization adoption. The next challenge is the significant cost. Implementing AI and digitalization requires significant upfront investment, including equipment procurement, workforce training, and software development. Furthermore, increased digitalization opens up more opportunities for cyberattacks, such as ransomware, phishing, and data theft, which can disrupt operations and cause financial losses (Misnawati in Daeng et al., 2023). The lack of skilled and experienced workforce in AI and digital technologies can hinder optimal implementation across various sectors. Furthermore, many organizations, especially small or traditional ones, struggle to adapt to technological change. Resistance to change is a key challenge. (Christian Iwan et al., 2023).

The steps to overcome these challenges include, firstly, increasing access to technology, governments and international organizations need to invest in technological infrastructure in remote areas to reduce the digital divide, secondly through education and training, digital literacy must be part of the educational curriculum, and technological skills training needs to be provided to workers to face changes in the world of work, thirdly strengthening regulations, strong, clear and effective regulations must be developed to protect privacy, prevent AI discrimination, and address ethical implications (Najwa Fathiro Cahyono et al., 2023), The fourth is through responsible AI development. AI must be developed transparently, taking into account the principles of fairness, accountability, and inclusivity. The fifth is through collaboration between government, the private sector, and academia, which must work together to create an inclusive and safe digital ecosystem (Setiawi et al., 2024), Meanwhile, the sixth is through investment in cyber security, organizations must improve their cyber defenses through encryption technology, threat monitoring, and security training for staff (Widianingrum, 2024).

Based on the findings of the literature review and various analyzed studies, it is evident that Artificial Intelligence (AI) holds a crucial position in revolutionizing Indonesia's educational landscape. AI's swift progress has significantly enhanced learning processes, outcomes, and overall student experiences. Beyond being a mere support tool, AI acts as a driving force for creating an education system that is efficient, adaptable, inclusive, and tailored to individual requirements. However, the success of AI implementation greatly depends on user readiness, including that of educators, students, and educational institutions. This readiness encompasses digital competence, adequate technological infrastructure, and the ability to adapt to change. Disparities in infrastructure and limited access to technology in underdeveloped regions remain major challenges that must be addressed through strategic policies and equitable technological development. Overall, the integration of AI holds great potential to create a more dynamic, modern, and inclusive educational ecosystem, while preparing younger generations to face global challenges and the Society 5.0 era. Nevertheless, this vision can only be achieved if all stakeholders including the government, educational institutions, the private sector, and society work collaboratively and synergistically to build a strong, secure, and equitable digital foundation.

4. CONCLUSION

In conclusion, the literature review highlights that artificial intelligence (AI) has a transformative role in shaping a more efficient, inclusive, adaptive, and sustainable education system. AI enables personalized learning, improves instructional quality, and supports teachers in assessment and learning management. At the same time, AI provides opportunities to prepare students with essential competencies for the future, such as technological literacy, creativity, and critical thinking, which are important in the era of digital transformation.

The implications of these findings indicate that successful AI integration in education requires comprehensive preparation, including the improvement of digital infrastructure, enhancement of teachers' digital literacy, and the development of ethical and regulatory frameworks for AI usage. Educational institutions and policymakers must also ensure equitable access to technology so that the benefits of AI can be experienced by all learners. Furthermore, teachers remain central figures in the learning process because they provide human values, empathy, and character education that cannot be replaced by technology.

For future research, further studies are recommended to explore the practical implementation of AI in different educational contexts, particularly in developing countries where technological readiness may vary. Future studies may also investigate the effectiveness of AI-assisted learning tools in improving specific learning outcomes, teachers' readiness to integrate AI in classrooms, and the ethical implications of AI use in education. In addition, longitudinal studies are needed to examine the long-term impact of AI integration on students' academic achievement, learning experiences, and educational equity.

5. ACKNOWLEDGEMENT

The author extends his sincerest appreciation to his supervisors for their invaluable guidance, direction, and encouragement throughout this research. He also extends his gratitude to the university, the authors, and previous researchers whose work served as primary sources of reference for this literature review.

He would also like to thank his family and colleagues for their prayers, support, and encouragement throughout the completion of this research.
The author acknowledges that this research has limitations. Therefore, constructive criticism and suggestions are highly appreciated for the improvement of future research. He hopes that this work will contribute to the development of science, particularly in the fields of education and technology.

6. REFERENCES

Afandi, & Kurnia. (2023). Revolusi teknologi: Masa depan kecerdasan buatan (AI) dan dampaknya terhadap masyarakat. *Academy of Social Science and Global Citizenship Journal*.

Anggito, & Setiawan. (2018). *Metodologi penelitian kualitatif*. CV Jejak.

Azzahra, A. D., & Ardiansyah, H. (2025). Studi literatur: Transformasi peran guru dalam ekosistem pendidikan digital berbasis kecerdasan buatan (AI). *Jurnal Tambusai, 9*(2).

Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of*

Educational Technology in Higher Education, 18(1), 1–24. https://doi.org/10.1186/s41239-021-00282-x

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access, 8*, 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Christian, Putra, Zabdi, Boy, Chandra, & Febrianti. (2023). Analisis pemanfaatan artificial intelligence dalam membantu proses perekrutan karyawan perusahaan. *Jurnal Sains dan Teknologi, 2*(2).

Daeng, Y., Levin, J., Prayudha, M. R., Ramadhani, N. P., Imanuel, S., & Daeng, A. Y. (2023). Analisis penerapan sistem keamanan siber terhadap kejahatan siber di Indonesia. *Journal of Social Science Research, 3*(6), 1135–1145.

Dewi, N. P. M., et al. (2025). Pilar: Peran artificial intelligence (AI) dalam pembelajaran berbasis teknologi di era digitalisasi pendidikan. *Prosiding Pekan Ilmiah Pelajar, 5*.

Edwin, Widiana, Lasmawan, & Suharta. (2025). Curriculum transformation towards future education. *Prima Magistra: Jurnal Ilmiah Kependidikan*.

Ellikal, & Rajamohan. (2024). AI-enabled personalized learning: Empowering management students for improving engagement and academic performance. *Emerald Insight*.

Fullan, M., Quinn, J., Drummy, M., & Gardner, M. (2021). *Education reimagined: The future of learning*. Collaborative Impact SPC.

Hanifah, M., & Purbosari, P. P. (2022). Studi literatur: Pengaruh penerapan model pembelajaran guided inquiry (GI) terhadap hasil belajar kognitif, afektif, dan psikomotor siswa sekolah menengah pada materi biologi. *BIODIK: Jurnal Ilmiah Pendidikan Biologi, 8*(2).

Hasanah, et al. (2024). Fostering inclusivity: Strategies for supporting students with special needs in mainstream classrooms. *FALASIFA: Jurnal Kestudian Islam*.

Hermawan, N., Dewi, D. A., & Ardiansyah, M. I. (2024). Budaya di era digital: Pengaruhnya terhadap masyarakat Indonesia. *MARAS: Jurnal Penelitian Multidisiplin, 2*(1), 1–6.

Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promise and implications for teaching and learning*. Center for Curriculum Redesign.

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education, 57*(4), 542–570. https://doi.org/10.1111/ejed.12502

Huang, R., Spector, J. M., & Yang, J. (2022). Educational technology and AI: A new era for learning. *Educational Technology Research and Development, 70*(4), 1557–1560. https://doi.org/10.1007/s11423-022-10120-1

Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2021). Vision, challenges, and future directions of AI in education. *Computers & Education: Artificial Intelligence, 2*, 100013. https://doi.org/10.1016/j.caeai.2021.100013

Insan, K., Huda, A., Irfan, D., & Hendriyani, Y. (2024). Study literature review penggunaan teknologi kecerdasan buatan dalam personalisasi pembelajaran online. *JTeKI: Jurnal Teknologi Komputer dan Informatika, 4*(3).

Kasman, R. A., Burhan, B., & HB, A. M. (2025). Peran dan tantangan kecerdasan buatan (AI) dalam pendidikan tinggi: Implementasi dan implikasi etis. *JPDP: Jurnal Pendidikan dan Pembelajaran, 5*(1).

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence in higher education. *Sustainability, 13*(18), 10424. https://doi.org/10.3390/su131810424

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). Intelligence unleashed: An argument for AI in education. *British Journal of Educational Technology, 53*(4), 1034–1048. https://doi.org/10.1111/bjet.13264

Misnawati. (2023). ChatGPT: Keuntungan, risiko, dan penggunaan bijak dalam era kecerdasan buatan. *Prosiding Seminar Nasional Pendidikan, Bahasa, Sastra, Seni, dan Budaya, 2*(1), 54–67.

Mufakhrasy, & Adawiyah. (2025). Pengaruh penggunaan artificial intelligence (AI) dalam pembelajaran dan dunia pendidikan. *Jurnal Tambusai*.

Nadya, R., Amalia, I., & Rachman, I. F. (2025). Analisis potensi dan tantangan dalam penggunaan AI di bidang pendidikan. *Semantik: Jurnal Riset Ilmu Pendidikan, Bahasa dan Budaya, 3*(2).

Najwa, F. C., ’Uyun, K., & Mukaromah, S. (2023). Etika penggunaan kecerdasan buatan pada teknologi informasi. *Prosiding Seminar Nasional Teknologi dan Sistem Informasi, 3*(1), 482–491.

Nawaf, A., Azura, S., Gultom, S. F., Afriansyah, W., & Putra, A. D. (2023). Analisis literasi digital dalam penggunaan media sosial di kalangan remaja Desa Payung Kec. Payung Kab. Karo. *Journal of Human and Education, 3*(2), 337–343.

OECD. (2021). *AI in education: Challenges and opportunities*. OECD Publishing.

OECD. (2023). *Shaping the future of education with artificial intelligence*. OECD Publishing.

Pratiwi, R. T. L., & Yunus, M. (2025). Manfaat dan tantangan penggunaan artificial intelligence (AI) bagi guru dan peserta didik di era Society 5.0. *Journal of Innovation and Teacher Professionalism, 3*(2).

Rahayu, S. (2024). Pemanfaatan artificial intelligence (AI) dalam penulisan artikel ilmiah. *Prosiding Pertemuan Ilmiah Tahunan Nasional Widyaiswara, 1*.

Rohman, H. I., et al. (2025). Disrupsi teknologi dalam pendidikan tinggi di Indonesia: Studi literatur tentang bagaimana artificial intelligence mengubah lanskap pembelajaran. *Jurnal Tambusai, 9*(2).

Selwyn, N. (2022). Less work for teacher? The irony of automated education. *Educational Philosophy and Theory, 54*(12), 1933–1945. https://doi.org/10.1080/00131857.2021.1991260

Setyawan, et al. (2024). Effectiveness of e-learning-based learning in the era of digital transformation: A meta-analysis. *Jurnal Undiksha*.

Siagian, et al. (2025). Optimalisasi pemanfaatan AI dalam menyusun artikel ilmiah untuk meningkatkan kualitas karya ilmiah mahasiswa Universitas Negeri Medan. *Jurnal Tambusai, 9*(1).

Syawaudin, I., Rizqia, D., Yumna, S., & Sisworo, A. W. (2025). Peran AI terhadap perkembangan kognitif peserta didik di sekolah menengah atas (SMA). *JUMI: Jurnal Multidisiplin Ilmu, 1*(1).

UNESCO. (2022). *Guidance on AI and education for policymakers*. UNESCO Publishing.

UNESCO. (2023). *Global education monitoring report: Technology in education*. UNESCO Publishing.

Widianingrum, A. R. (2024). Analisis implementasi kebijakan hukum terhadap penanganan kejahatan siber di era digital. *Journal Iuris Scientia, 2*(2).

Yani, A. (2024). Peran artificial intelligence sebagai salah satu faktor dalam menentukan kualitas mahasiswa di era Society 5.0. *Journal of Education Research, 5*(2).

Zhai, X., He, P., & Krajcik, J. (2021). Applying machine learning in science education. *Journal of Science Education and Technology, 30*(5), 684–698. https://doi.org/10.1007/s10956-021-09907-8

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2021). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education, 18*(1), 1–27. https://doi.org/10.1186/s41239-021-00270-1