

THE ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN THE PERSONALISATION OF EDUCATION IN THE SOCIETY 5.0 ERA

Syahrul Nizam

Universitas Sultan Muhammad Syafiuddin Sambas, Indonesia

*Corresponding author: syahrulnijamm@gmail.com

ABSTRACT

The development of digital technology in the *Society 5.0* era demands a *human-centred* transformation of education, utilising artificial intelligence (AI) to create adaptive and personalised learning experiences. This study aims to conduct an in-depth examination of the implementation of artificial intelligence-based personalised learning in the *Society 5.0* era, encompassing an analysis of its effectiveness for learners, a description of its various forms of application, and an identification of its strengths and weaknesses within an educational context. The method employed is a literature review using a descriptive-interpretative approach, involving the collection, selection, processing, and analysis of data from various credible sources such as books, scientific journals, and reliable online publications. The research findings indicate that AI is effective in personalising learning by enhancing motivation, student engagement, flexibility and digital literacy. Forms of AI implementation include virtual tutors, smart content and personalised learning platforms such as Khan Academy, Duolingo and Ruangguru. However, its implementation faces three main challenges, namely: (1) the erosion of the teacher's role and social interaction, which risks undermining holistic learning; (2) the decline in digital ethics, manifested in student data vulnerabilities, algorithmic bias and the 'black box' phenomenon; and (3) a decline in independent learning due to reliance on instant solutions that weaken students' critical and metacognitive thinking skills. This study concludes that whilst AI holds great potential for improving the quality of education, its use must be balanced by strict ethical regulations, participatory oversight, and the strengthening of the teacher's role as a humanistic facilitator in order to create an educational system that is fair, inclusive, and oriented towards character development and 21st-century skills.

Keywords: Personalised Learning; Artificial Intelligence (AI); *Society 5.0*; Literature Review; Digital Education

INTRODUCTION

Rapid developments in digital technology have ushered humanity into a new era known as *Society 5.0*, a concept of society proposed by the Japanese Government in which digital technology and artificial intelligence are harmoniously integrated into human life to create social well-being. Unlike the previous era (*Industry 4.0*), which focused more on efficiency and automation, *Society 5.0* places humans at the centre (human-centred) and utilises technology to resolve various social issues (Fukuyama, 2018). In the context of education, the *Society 5.0* era demands the development of human resources capable of critical thinking, creativity, collaboration and communication, as well as possessing the ability for lifelong learning.

Artificial Intelligence, or more commonly known by the acronym AI, is one of the rapidly developing fields of technology and plays a strategic role in realising the vision for education in this era. AI refers to the ability of machines or computer programmes to mimic human intelligence in various aspects, including decision-making, logic, natural language processing, and even learning from experience (Suharmawan, 2023). Across various fields, AI has had a significant impact, including in the world of education, where its use offers extensive benefits

for both teachers and learners and opens up opportunities to improve the quality and efficiency of the learning process.

AI-based personalised learning is one of the key pillars in realising education in the *Society 5.0* era, as every individual has different needs, learning speeds and learning styles. This pedagogical approach utilises adaptive systems to tailor the teaching and learning process to each learner's unique profile. According to Mukti (2023), this approach stems from the realisation that pupils exhibit a wide variety of cognitive development characteristics, learning styles and rates of comprehension, meaning that a 'one-size-fits-all' approach is no longer adequate. One of the key benefits of AI for teachers is its ability to help identify learners' learning patterns and analyse learning outcome data more accurately and quickly, enabling them to tailor teaching methods to the needs of each individual. AI can also predict learners' future performance, providing insights into potential successes or difficulties they may face. Consequently, teachers can design more timely and targeted interventions (Mubin et al., 2023). Consequently, this study aims to conduct an in-depth examination of the implementation of artificial intelligence-based personalised learning in *the Society 5.0 era*, encompassing an analysis of its effectiveness for learners, a description of its various forms of application, and an identification of its strengths and weaknesses within an educational context

METHODS

This study employs a literature review method to collect, analyse, and synthesise data from various written sources relevant to the research topic. (George, 2015; Zed, 2003) This method was chosen to establish a strong theoretical foundation prior to conducting further research. The data sources used included primary literature (books, scientific journals) and secondary literature (research reports, theses, and reliable online publications). (Sugiyono, 2019) The research procedure consists of five main stages: (1) data collection from relevant literature sources; (2) selection and recording of sources appropriate to the topic; (3) logical and systematic data processing; (4) presentation of results in the form of a narrative and practical implications; and (5) drawing of conclusions. Data analysis was conducted using a descriptive-interpretative approach by identifying patterns and relationships between sources to gain an in-depth understanding of the phenomenon under study. (John, 2014)

Validity in this study was ensured through the use of credible, reliable and up-to-date sources. With this approach, the literature review method serves not only as a means of gathering information (Sugiyono, 2019), but also as an analytical tool to support a comprehensive discussion and conclusion.

FINDINGS AND DISCUSSION

The effectiveness of utilising AI in personalising student learning in the *Society 5.0* era

An increase in learning motivation, student engagement and digital skills can be fostered through the use of artificial intelligence (AI). This indicates that AI is effective in personalising learning. In line with this, AI plays a strategic role in *the Society 5.0 era* and functions as a learning assistant that helps teachers to support pupils in a more meaningful way. This assertion is supported by research by Harsono, Suriansyah and Ridhaningtyas (2024), who implemented AI-based personalised learning in primary schools. The research results show promising outcomes, even in areas with limited infrastructure. The implementation of diagnostic

assessment, differentiated learning, and the use of AI-based platforms and quizzes in primary schools in wetland areas has proven capable of boosting students' enthusiasm for learning, engagement, learning flexibility and digital skills, whilst also enriching the classroom learning environment.

This view is reinforced by Zebua (2024), who states that AI plays a strategic role in learning in the *Society 5.0* era by providing adaptive solutions, personalised learning and administrative efficiency. By utilising AI-based learning platforms, educational chatbots and virtual reality, AI also helps to develop 21st-century skills, such as digital literacy and global collaboration. The optimisation of AI not only enhances the quality of learning but also prepares the younger generation to face future challenges in an inclusive and humanistic manner, in line with the vision of *Society 5.0*.

In line with this, the findings of Hamida et al. (2025) confirm that AI functions as an effective learning assistant in personalising education for each pupil. AI enables the customisation of learning materials, learning pace, and the provision of feedback tailored to individual needs. Consequently, teachers can focus more on mentoring and meaningful interaction with pupils, which in turn makes AI an effective tool for improving the quality of education and making the learning process more meaningful.

Forms of artificial intelligence (AI) application in personalised learning in the *Society 5.0* era

Personalised learning and adaptive learning essentially share the same objective: to create a more effective learning experience by tailoring the educational process to the unique characteristics of each pupil. Personalised learning emphasises the adaptation of content and learning pace based on individual ability, so that pupils are more motivated and teachers can give greater attention to those who need it (Yusuf, 2024), whilst adaptive learning goes a step further by designing a completely unique experience based on pupils' personalities, interests and abilities, and involves adaptive reasoning encompassing deductive, inductive and intuitive reasoning to develop logical and deep thinking skills; both approaches equally consider learning objectives, pupils' needs and environmental conditions in the selection of their media (Putra et al., 2019), thereby contributing overall to improving the quality of education in a way that is more relevant, enjoyable and tailored to the needs of each individual learner.

Personalised learning is becoming increasingly important because every pupil has unique learning characteristics, including different paces, styles and cognitive preferences; consequently, the traditional 'one-size-fits-all' approach is no longer adequate in the context of modern education, which demands flexibility and responsiveness; this is where artificial intelligence (AI) plays a crucial role, as it enables the real-time identification of pupils' learning patterns, interests and difficulties, allowing teachers to tailor learning materials and strategies to the specific needs of each pupil (Ali, Rahman, & Singh, 2024).

The role of AI in personalised learning in primary schools encompasses three main functions. Mukti (2023) and Haetami (2025) explain that AI can help teachers:

1. Provide content tailored to pupils' learning pace,
2. Provide automatic feedback,
3. Support the process of learning reflection.

Based on the concepts outlined above, there are several forms of AI application in personalised learning in the *Society 5.0* era. According to Mutaqin et al. (2023), these forms include:

Virtual Mentor

Virtual mentors are capable of providing comments, advice and assessing the practice questions completed by pupils. This tool enables pupils to receive individual guidance without having to wait for their turn with the teacher, so that the learning process can take place independently whilst remaining well-guided.

Smart Content

Smart content takes the form of digital books and learning materials recommended by AI based on pupils' needs and level of understanding. An example of its application is the Kippin app, which provides primary school textbooks tailored to the curriculum and pupils' abilities.

Personalised Learning Platforms

Platforms such as Khan Academy, Duolingo and Ruangguru use AI to tailor content, exercises and the pace of learning to each student's profile. These systems also provide instant feedback and recommendations for relevant next-step materials (Madjid Afandi, 2021). These three forms of application are in line with the principles of *Society 5.0*, which emphasises collaboration between humans and technology to create learner-centred education. Virtual mentors, smart content and personalised learning platforms enable each individual to learn at their own pace and in their own style, thereby fostering a society committed to lifelong learning. Thus, AI serves not only as a tool but also as a collaborative partner that supports the development of high-calibre human resources capable of adapting to global changes in the *Society 5.0* era.

Based on the above, it can be concluded that in the *Society 5.0* era, artificial intelligence (AI) plays a strategic role in realising personalised learning. AI helps teachers analyse learning patterns, predict pupil performance, and design targeted interventions. The concept of AI-based personalised learning emphasises an adaptive approach that values the uniqueness of each learner, particularly in primary schools, through three key functions: the provision of content tailored to individual learning pace, the delivery of automated ' ' feedback, and support for learning reflection. Relevant forms of AI implementation include virtual mentors, smart content, and personalised learning platforms such as Khan Academy, Duolingo, and Ruangguru. All these implementations are in line with the principles of *Society 5.0*, which emphasise collaboration between humans and technology, lifelong learning, and a learner-centred approach.

Advantages and disadvantages of AI implementation for personalised learning in the context of education within Society 5.0

Advantages

AI can analyse pupils' learning patterns, adjust the difficulty level of the material, and provide recommendations tailored to their individual needs. This approach allows pupils to learn at their own pace without feeling rushed or left behind by their peers. Furthermore, AI also offers advantages in terms of accessibility. This technology can be used anytime and anywhere, allowing students to learn without being constrained by specific times or locations. This is particularly helpful for students with limited access to formal education, such as those living in remote areas or with physical limitations that make it difficult for them to attend school.

in person. AI is also capable of improving the efficiency of learning assessment. Through automation technology, AI can provide immediate feedback on pupils' performance, identify the mistakes they make, and offer solutions tailored to their needs. This enables pupils to learn more quickly and improve their understanding of the subject matter (Yustiasari Liriwati, 2023).

Disadvantages

The erosion of the teacher's role and social interaction

Teachers play a vital role in traditional education, as they not only deliver the curriculum but also act as motivators, facilitators and emotional mentors who build strong interpersonal relationships with their pupils (Suryanto et al., 2024). However, AI is beginning to supplant this role by taking over tasks such as monitoring learning, delivering the curriculum and assessing learning outcomes. This makes learning more adaptive and personalised (Nasihuddin, 2024; Afrita, 2023), yet this shift may also reduce the human interaction that is essential for holistic learning, as AI cannot replace the social sensitivity, empathy and flexibility of response possessed by teachers (Husain, 2020).

Consequently, there are weak interpersonal relationships between teachers and pupils, particularly in schools where direct interaction is vital for building character and social values (Alifiani, 2017). Furthermore, teachers face the risk of 'deskilling', namely a lack of ability to manage the classroom, build interpersonal relationships, and develop creative strategies (Pongoh et al., 2023) . Psychological impacts are also felt by teachers, namely a sense of being replaced by machines, which reduces their motivation to work, whilst pupils lose their self-confidence and sense of security because AI cannot meet their emotional needs (; Darmayasa et al., 2025;). The use of AI as a substitute for teacher interaction within Indonesian culture, which prioritises familial relationships, may lead to resistance and a clash with local values . The hybrid learning model is one example of a solution that balances the roles of teachers and AI. However, for teachers to continue to fulfil their social and pedagogical roles, they require specialised training (Astuti et al., 2025). Teacher-pupil interaction is vital for fostering social-emotional skills such as empathy, collaboration and communication, which cannot be provided by machines (Prmana et al., 2025). Overall, the role of the teacher and humanistic interaction must remain in balance, with AI positioned as a tool rather than a substitute for the teacher.

The Decline of Digital Ethics

Many educational AI systems do not meet adequate standards of security and transparency, leaving pupils' data vulnerable to misuse, leaks and commercial exploitation (Pardosi et al., 2024) . Violations of students' digital rights may occur because Indonesia's personal data protection legislation is relatively new and does not specifically regulate the use of AI in education (Pelangi et al., 2025) . Technology companies threaten users' privacy when they exploit data for commercial gain.

AI also faces issues of algorithmic bias because algorithms are built from data that is not always representative, which can result in discriminatory decisions in assessment, selection or learning recommendations (Selwyn, 2019). This bias can widen existing educational disparities and exacerbate the gap between more developed and underdeveloped regions (Andriyani et al., 2025). A lack of transparency leads to the emergence of the 'black box' phenomenon, where educators, pupils and parents face challenges in understanding AI decisions, which undermines trust and accountability (Raharjo, 2023). When AI makes

decisions that are detrimental to pupils, it is unclear who is responsible. Strict regulations covering data protection, algorithmic transparency and participatory oversight mechanisms are required to address these various issues (Irawan, 2024; Afrita, 2023).

Discrimination can be avoided if the development of AI adheres to inclusive design principles that recognise cultural, social and economic diversity (Lestari et al., 2023). Digital literacy is essential for teachers, pupils and parents to understand the risks and how to manage AI safely and ethically (Nasihuddin, 2024).

Excessive use of AI can stifle the creativity and innovation of pupils and teachers as they are forced to conform to the system's rigid recommendations (Rizkiyah et al., 2025). Furthermore, by developing this critical awareness, they can become intelligent and responsible technology users and promote the equitable use of AI. In conclusion, advances in AI in education must be accompanied by strict oversight and ethical policies so that the technology can build an education system that is fair, inclusive and protects the rights of all pupils.

Declining Independence in Learning

Excessive use of AI in education can lead to dependency, which is detrimental to the learning process, particularly in terms of pupils' ability to think critically and become independent. Pupils become accustomed to instant solutions and lose important cognitive skills such as analysis, synthesis and evaluation because AI is too helpful in completing tasks or answering questions (Pongoh et al., 2023; Istikomah et al., 2024). This situation leads to the phenomenon of passive learning, where pupils no longer engage in active tasks because they are overly reliant on technology. Adaptive systems, on the other hand, make students feel comfortable and uninterested in trying new things (Nasihuddin, 2024). Consequently, students' metacognitive abilities decline; these are the abilities to reflect on and regulate their own learning processes (Husain, 2020).

Reliance on AI also affects the role of teachers. Their previous position as active facilitators may become passive due to over-reliance on the system's recommendations. This hinders the development of pedagogical innovation and contextual teaching strategies (Nasir & Sunardi, 2025; Rafiq, 2025). Pupils with limited access are falling behind, whilst those who use artificial intelligence are losing vital skills (Istikomah, 2024). Consequently, the educational gap is widening.

AI also eliminates curiosity and the challenges of learning, thereby reducing students' intrinsic motivation. In fact, creativity, problem-solving and critical thinking flourish better in classrooms that demand active engagement rather than passive consumption of information (Hendriani, 2020). The development of character traits such as discipline, responsibility and perseverance is vital for independent learning. Without a process of effort and failure, learning cannot take place (Muslich, 2022). Overly digital learning reduces face-to-face interaction and collaboration, resulting in a decline in pupils' social skills (Darmayasa et al., 2025).

This issue can be resolved by using AI solely as a tool rather than as a substitute for human interaction and thought processes. Teachers must be able to support pupils' learning by balancing the use of AI with strategies that foster creativity, independence and critical thinking. The curriculum must also emphasise the development of soft skills and 21st-century competencies, so that technology serves merely as a supporting tool rather than the primary determinant of the learning process.

CONCLUSION

Artificial intelligence (AI) has proven effective in personalising learning in the *Society 5.0* era. The strategic role of AI in the *Society 5.0* era encompasses the provision of adaptive solutions, personalised learning and administrative efficiency, whilst also developing 21st-century skills such as digital literacy and global collaboration. The three main forms of AI application include virtual mentors, smart content, and personalised learning platforms. All three align with the principles of *Society 5.0*, which prioritise human-technology collaboration and lifelong learning. However, the implementation of AI faces three key challenges. Firstly, the erosion of the teacher's role and social interaction, which risks undermining holistic learning. Secondly, the decline in digital ethics, manifested in student data vulnerabilities, algorithmic bias, and the 'black box' phenomenon, which reduces transparency. Thirdly, a decline in independent learning due to reliance on instant solutions, which weakens students' critical and metacognitive thinking skills.

REFERENCES

- Afandi, M. (2021). The importance of applying artificial intelligence in education. Article: Artificial Intelligence in Education, 1–2.
- Afrita, J. (2023). The role of artificial intelligence in enhancing the efficiency and effectiveness of the education system. COMSERVA: Journal of Research and Community Service, 2(12), 3181–3187.
- Ali, M., Rahman, F., & Singh, T. (2024). A systematic review of ChatGPT in education: Potentials and challenges of generative AI. Bohrium Research Repository.
- Alifiani, K. (2017). The relevance of Munif Chatib's theory of multiple intelligences to the concept of human fitrah in Islamic education. [Undergraduate or Master's thesis, UIN Sunan Kalijaga].
- Andriyani, W., Natsir, F., Asri, Y. N., Hidayat, M. S., Yati, Y., Afandi, I. R., ... & Sujarwo, A. (2024). Generative AI and the quality of education. Widina Publishers.
- Astuti, N. D., Sulastri, A., & Puspito, W. G. (2025). Education in the digital age. PT. Sonpedia Publishing Indonesia.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Darmayasa, D., Lakadjo, M. A., Juasa, A., Rianty, E., Efitra, E., Wirautami, N. L. P., & Calam, A. (2025). Education in the digital age: Challenges and opportunities. Henry Bennett Nelson.
- George, & Djiwando. (2015). *Literature review: Theory and application*. Prenada Media.
- Haetami, H. (2025). AI-driven educational transformation in Indonesia: From learning personalisation to institutional management. Journal of Educational Innovation.
- Hamida, E., Andika, C., Aroma, N., Hadevi, M., & Rifa'i. (2025). AI as a learning assistant: How technology helps personalise education for every pupil. Department of Digital Business Journal of Artificial Intelligence and Digital Business (RIGGS), 4(2), 6580–6585.
- Harsono, A. M. B., Suriansyah, A., & Ridhaningtyas, L. P. (2024). Implementation of artificial intelligence-based personalised learning in Wetland primary schools. Pedagogik Journal

- of Islamic Primary School, 9(1), 113–129.
- Hendriani, A., Rohayati, E., & Herlambang, Y. T. (2020). Education and 21st-century thinking skills. Ksatria Siliwangi.
- Husain, H. M. N. (Ed.). (2020). Critical literacy based on IESQ power: Examining millennials in the digital age. Zahir Publishing.
- Irawan, I. (2024). The application of Pancasila ethics in the development of responsible artificial intelligence in Indonesia. *bit-Tech*, 7(2), 263–271.
- Istikomah, E., Suryadi, D., Prabawanto, S., & Nurlaelah, E. (2024). The future of learning in the 21st century: Creative and mathematical thinking skills amidst the rise of artificial intelligence (AI). *Journal of Mathematics Education*, [Volume and page numbers if available].
- Kamil, I., & Miranda, T. (2025). The impact of AI on university students. *JEDBUS (Journal of Economic and Digital Business)*, 2(1), 33–40.
- Lestari, D. A. (2024). Workshop on artificial intelligence-based learning media. *Thawalib Journal of Community Service and Research*, 3(1), 25–32.
- Mubin, H., Nurwanti, R., & Setiawan, A. (2023). The role of AI in identifying learners' learning patterns. *Journal of Modern Education*, 5(3), 111–125.
- Muslich, M. (2022). Character education: Addressing the challenges of a multidimensional crisis. Bumi Aksara.
- Mutaqin, F. M., Jubaedah, I., Koestianto, H., & Setiabudi, D. I. (2023). The effectiveness of artificial intelligence (AI) in learning and teaching. *Journal of Education: Seroja*, 2(1).
- Nasihuddin, M. (2024). The role of artificial intelligence in the transformation of education in the digital age. *Salimiya: Journal of Islamic Religious Studies*, 5(4), 410–418.
- Nasir, M., & Sunardi, S. (2025). The reorientation of Islamic education in the digital age: A theoretical analysis of ‘ ’ and a literature review. *Al-Rabwah*, 19(1), 56–64.
- Pelangi, K. C., Zohrahayaty, M., Idris, I. S. K., Serwin, M., ... & Kom, M. (2025). Ethics and law in information technology. Takaza Innovatix Labs.
- Pongoh, D., Kasenda, M., Kasenda, S., Tondatuon, G., Taroreh, M., & Saleh, E. (2023). The application of artificial intelligence (AI) in education. *Journal of Computer Science and Information Systems*, 9(4).
- Pramana, P., Utari, P., Alkhajar, E. N. S., & Widiarti, M. A. (2025). The future of communication: Exploring the role of artificial intelligence in human interaction. *Samvada: Journal of Communication, Media and Public Relations Research*, 4(1), 39–71.
- Putra, R. A., Siregar, W. S., & Gusmaneli, G. (2024). Adaptive learning models: Towards enhancing the effectiveness of learning in the digital age. *ALFIHRIS: Journal of Educational Inspiration*.
- Putri, V. A., Carissa, K., Sotyawardani, A., & Rafael, R. A. (2023). The role of artificial intelligence in the learning process of students at Surabaya State University. *Proceedings of the National Seminar*, 615–630.
- Rafiq, A. (2025). Orientation for new Master's and PhD students at UIN Sunan Kalijaga 2025. [Paper or Presentation].
- Raharjo, B. (2023). Ethical theories in artificial intelligence (AI). Published by Yayasan Prima

Agus Teknik.

- Rizqiyah, N., Jauhari, A. H., Fawaied, M., & Maudy, M. (2025). *The digital revolution in education: The role of technology and social media in learning*. KBM Indonesia Publishers.
- Selwyn, N. (2024). On the limits of artificial intelligence (AI) in education. *Nordisk tidsskrift for pedagogikk og kritikk: Special Issue on Artificial Intelligence in Education*, 10, 3–14.
- Sugiyono. (2019). *Quantitative, qualitative and R&D research methods*. Alfabeta.
- Suharmawan, W. (2023). The use of ChatGPT in education. **Education Journal: Journal of Educational Research and Development**, 7(2), 158–166.
- Suryanto, I. W., Astuti, N. M. E. O., Prastyandhari, I. G. A. I. M., & Sentosa, I. P. P. (2024). *A reference book on the dual role of teachers: As educators and parents in the digital age*. Uwais Inspirasi Indonesia.
- Wathoni, N. (2021). *The development of students' character and soft skills through school culture at SMK Negeri 41 Jakarta* [Master's thesis, PTIQ Institute, Jakarta].
- Yusuf, B. (2024). Technology and personalised learning in Islamic education for Generation Z. *Journal of Instructional and Development Researches*, 4(4), 277–285.
- Zebua, N. (2024). Optimising the potential and utilisation of artificial intelligence (AI) to support learning in the Society 5.0 era. *Pentagon: Journal of Mathematics and Natural Sciences*, 2(4), 162–172.
- Zed, M. (2003). *Literature-based research methods*. Obor Indonesia Foundation