SAINTIS
publishing

Research Article

The Influence of the Use of AI in Mathematics Learning at the High School Level: A Systematics Literature Review

Widya Rahmatika*, Mursalin, Eri Saputra, Mutia Fonna

Department of Mathematics Education, Universitas Malikussaleh, Aceh Utara, 24355, Indonesia
*Corresponding Author: widya.210710059@mhs.unimal.ac.id

ABSTRACT

The application of artificial intelligence (AI) in mathematics learning at the high school (SMA) level is now an important innovation in the world of education. AI brings a number of benefits such as the ability to personalize the learning process, increase efficiency, and provide broad and fast access to learning materials. However, its utilization is inseparable from various challenges. This study aims to identify and analyze the problems of the use of AI in high school mathematics learning systematically through the Systematic Literature Review (SLR) method with the PRISMA approach to 15 selected scientific articles. The results of the study show that the use of AI raises problems at various levels, especially in students who experience a decrease in critical thinking skills, creativity, and learning independence due to dependence on technology and an increasing tendency to plagiarism and procrastination. Meanwhile, from the side of teachers and educational institutions, obstacles were found in the form of low digital skills, limited training, lack of infrastructure, and the absence of a curriculum that accommodates the use of AI to the maximum. Although AI is well received by students, its use in schools is still very limited, reflecting a gap between potential and implementation. In addition, ethical aspects, data privacy, and changes in the role of teachers are important concerns. Therefore, collaboration across teachers, educational institutions, policy makers, and parents is needed to ensure the use of AI that is wise, ethical, and able to support the development of students' character and thinking abilities optimally.

Keywords: Artificial Intelligence; AI Problems; Mathematics Learning; Critical Thinking; High School Education; Technology dependence; Teacher Competence; Systematic Literature Review

1. INTRODUCTION

The contemporary world has definitely entered the digital age, a period marked by technological disruption at an unprecedented pace. The massive flow of information and almost limitless connectivity have become the new foundation for civilization. This phenomenon is conceptualized within the framework of the Industrial Revolution 4.0, which emphasizes the convergence between the physical, digital, and biological worlds through technological pillars such as *the Internet of Things (IoT)*, *Big Data*, cloud computing, and most importantly, *Artificial Intelligence* (Lukman et al., 2024). In line with that, Japan introduced the vision of Society 5.0, a concept of a super-intelligent society centered on people, where this advanced technology is leveraged to address social challenges and improve the quality of life inclusively. This dual transformation has overhauled the economic, social, and cultural landscape, as well as putting strong pressure on all sectors to evolve and the education sector is at the forefront of these changing demands (Deguchi et al., 2020). For educational institutions, adapting to technology is no longer an option, but an imperative to maintain relevance and prepare the younger generation for the reality of an increasingly digitized world (Machmudah & Cholis, 2023).

It is in this context of adaptation imperatives that one branch of technology emerges as the spearhead of the most transformative innovation: Artificial Intelligence (AI). In contrast to previous educational technologies that were static and programmatic, AI represents a paradigm leap. It offers a system capable of simulating some of the cognitive functions of humans, such as the ability to 'learn' from data, recognize complex patterns, and make decisions or predictions (Khanal et al., 2024). It is in this context of adaptation imperatives that one branch of technology emerges as the spearhead of the most transformative innovation: Artificial Intelligence (AI). In contrast to previous educational technologies that were static and programmatic, AI represents a paradigm leap. It offers a system capable of simulating some of the cognitive functions of humans, such as the ability to 'learn' from data, recognize complex patterns, and make decisions or predictions (Vela et al., 2022). Thus, AI no longer stands on the doorstep of the world of education; it has entered and actively become part of the daily learning landscape, both inside and outside the classroom (Suariqi Diantama, 2023).

In particular, in the discipline of mathematics as a subject that is often considered abstract, hierarchical, and a source of anxiety for many students, AI integration offers a compelling set of pedagogical promises. Its ultimate potential lies in

its ability to realize personalized learning on a scale previously unimaginable (Januar & Burhan, 2024). AI systems can analyze students' answer patterns, identify specific weaknesses on specific topics for example, difficulties in algebraic factorization or understanding derivative concepts in calculus and then automatically present adaptive learning paths. Students who have difficulty will get reinforcement practice questions and prerequisite materials, while students who understand faster can advance to more complex challenges (Auna & Hamzah, 2024). In addition, AI provides instant *feedback*, a crucial element in mathematics. Conceptual errors that are not corrected immediately can take root and hinder the understanding of subsequent topics. With AI, students can find out where their mistakes are in *real-time*, creating a much faster and more effective self-learning cycle (Maulidya & Insani, 2024). Finally, AI is able to bridge the gap between symbols and intuition by turning abstract concepts into interactive visual objects. Imagine students being able to manipulate a three-dimensional function graph with their fingers, see how parameter changes affect the shape of the parabola, or visually simulate the limit theorem. In short, the promise offered by AI is a mathematics learning ecosystem that is more personalized, responsive, and able to penetrate the boundaries of conventional understanding (Sya'idan & Ali, 2025).

Behind this brilliant progress and efficiency lies a paradox that is at the heart of the problems of this research. The ease of access to instant answers and step-by-step solutions offered by AI, if not moderated wisely, has the potential to give birth to a series of serious pedagogical challenges. The main concern is the emergence of the phenomenon of *over-reliance*, where AI switches functions from a learning aid to a "*cognitive crutch*". When faced with math problems, students' first impulse is no longer to grapple with problems and activate their thinking skills, but to reach for digital devices (Firdaus et al., 2025). As a result, the essence of learning mathematics, namely the process of reasoning, trying various strategies, learning from mistakes, and building a solid conceptual understanding, is in danger of being overlooked. Students are positioned as passive consumers of finished answers, not as active producers of knowledge. At this point, the crucial question that arises is not "are students getting the right answers?", but rather "are students really learning?" (Yuliastuti et al., 2024). A conscious effort is needed to navigate the intersection between AI's transformative potential and the risks that come with it. For this reason, a systematic and in-depth literature review is indispensable to comprehensively map the various dimensions of this problem based on existing research findings. This research is expected to be an *evidence-based* foundation for educators and policymakers in designing intervention strategies and guidance on the use of AI that aims to optimize its benefits while proactively mitigating its negative impacts.

2. RESEARCH METHOD

This study uses the design of Systematic Literature Review (SLR). This method was chosen because of its ability to identify, evaluate, and synthesize all relevant and available research evidence on a topic in a structured, transparent, and replicable manner. In contrast to traditional narrative literature reviews which can be subjective, SLR aims to minimize bias by using explicit and strict protocols. Given that the purpose of this study is to comprehensively map the problems of the use of AI in high school mathematics learning, the SLR approach is the most appropriate method to produce solid and accountable findings (Arissona Dia Indah Sari et al., 2023). To ensure transparency, accuracy, and *replicability* of the literature review process, the research workflow adopts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. PRISMA is not a research method itself, but an evidence-based reporting framework that provides checklists and *flowcharts* to guide researchers in reporting the stages of a systematic study clearly. The use of PRISMA guidelines ensures that every step, from source identification to final article selection, is well-documented so that readers can assess the validity of the process and research findings (Febrianti, 2024).

To provide clear boundaries and ensure each article analyzed has high relevance, this study uses the PIO framework (Yasmin & Yoto, 2023). This framework serves as a guide in the literature selection process. The 'Population' (P) component in this study specifically refers to students and teachers at the high school (SMA) level, as the main actors who are directly involved in the learning process. Furthermore, the 'Interest' component (I) or the phenomenon that is the focus is the use of various types of Artificial Intelligence (AI) tools in mathematics learning. This is not limited to just one platform, but covers a wide spectrum of AI tools such as problem-solving applications, educational *chatbots*, and *intelligent tutoring systems*. Finally, the 'Results' (O) component that is the target of search in the literature is not quantitative data, but rather a qualitative identification and description of the problems that arise. These include pedagogical challenges (such as dependency and decline in critical thinking skills), implementation constraints for teachers, as well as ethical and accessibility issues. Thus, this PIO framework ensures that each literature selected for analysis actually addresses the issues (O) that arise from the utilization of AI (I) among the high school (P) community.

The primary data for this systematic literature review are scientific articles relevant to the research topic obtained from academic publications. To ensure comprehensive coverage and capture high-quality literature, a search strategy is carried out on a number of digital databases, both on an international and national scale. International databases that are the main sources include Scopus, Google Scholar, ERIC (Education Resources Information Center), and ScienceDirect. The selection

of this database is based on its reputation in indexing global scientific publications that have gone through the *peer-review* process as well as its broad scope in the fields of education and technology. In addition, to capture relevant research in the context of education in Indonesia, searches will also be carried out on the GARUDA (Garba Digital Referral) portal. The main focus of the search is scientific journal articles and conference proceedings published within a predetermined time frame to maintain the relevance of findings to the latest AI developments.

The data search strategy for this study was systematically designed using a combination of specific keywords and Boolean operators (AND, OR) to maximize the scope of relevant findings while filtering out inappropriate results. OR operators are used to broaden searches by combining synonymous terms in a single concept, while AND operators are used to narrow down results by ensuring each key concept of research is represented. For searches on international databases, a combination of keywords in English is used, such as: *("Artificial Intelligence" OR AI OR "Machine Learning" OR "Intelligent Tutoring System" OR "ChatGPT" OR "Generative AI") AND ("Mathematics Education" OR "Math Learning" OR "Math* Instruction") AND ("High School" OR "Secondary School") AND ("Problem" OR "Challenge" OR "Issue" OR "Barrier" OR "Limitation").* Meanwhile, to capture research relevant to the context of domestic education from the national database, a similar approach was used with keywords in Indonesian. Examples of search strings are: *("Artificial Intelligence" OR AI OR "Machine Learning") AND ("Mathematics Learning" OR "Mathematics Education") AND ("High School" or High School) and (Problematics OR Challenges OR Obstacles OR "Negative Impacts").* It should be noted that in practice, the use of quotation marks (" ") to search for the exact phrase and an asterisk (*) as *a wildcard* to cover word variations can be adjusted following the syntactic rules of the search engines in each database.

3. RESULTS AND DISCUSSION

3.1 Results

In accordance with the research methodology that has been described, below will present the findings of the systematic literature review and its discussion. A rigorous literature selection process succeeded in identifying a total of 15 scientific publications that met the inclusion criteria. Through the thematic analysis process of the entire article, several main themes related to the problem of the use of AI in mathematics learning at the high school level were successfully formulated. In the next section, this chapter will present an overview of the selected literature, followed by an in-depth description and discussion of each theme found.

Table 1. Selected Articles on AI in Mathematics Learning

Author (Year)	Article Title	Research Results
(Firdaus et al., 2025)	Ketergantungan Penggunaan Kecerdasan Buatan (AI) pada Tugas Akademik Mahasiswa Terhadap Kemampuan Berpikir Kritis dan Kreatif *[Dependence of the Use of Artificial Intelligence (AI) on Student Academic Tasks for Critical and Creative Thinking Ability]*	The use of artificial intelligence (AI) in the world of education is like a double-edged sword. AI is indeed very helpful for students to complete assignments because it offers ease and quick access to information. However, if they rely too much on AI, their critical thinking skills and creativity can decline. This happens because students often use AI to get answers without thinking deeply first, so their analytical and creative skills are not honed.
(Auna & Hamzah, 2024)	Studi Perspektif Siswa Terhadap Efektivitas Pembelajaran Matematika Dengan Penerapan Chatgpt *[Students' perspective study on the effectiveness of mathematics learning with the application of chatgpt]*	Although high school students show a high level of satisfaction with AI such as ChatGPT as a math learning aid, a problem arises from the very minimal frequency of its use in schools. The contradiction between this positive reception and the practice of infrequent use hints that the learning environment in schools has not yet fully supported the integration of AI. This shows that there are various barriers that limit students from utilizing this technology in formal learning, so that its full potential as an educational aid has not been realized.
(Maulidya & Insani, 2024)	Pemanfaatan Articial Intelligence (AI) dalam Pembelajaran SMP *[Utilization of Artificial Intelligence (AI) in junior high school learning]*	A case study at SMP Negeri 2 Mandau highlights the digital competency gap among teachers, many of whom are not familiar with interactive learning platforms such as Kahoot, or are already aware of it but have not implemented it. The main obstacle identified is the lack of professional development programs, such as

		workshops or training, that can equip teachers with the skills to integrate technology in teaching. This condition reflects a broader challenge for educators to continue to adapt to the digitalization of education. To address this problem, collaborative and synergistic efforts involving various stakeholders, including governments, educational institutions, and the community are needed.
(Lukman et al., 2024)	Problematika Penggunaan Artificial Intelligence (AI) untuk Pembelajaran di Kalangan Mahasiswa STIT Pemalang *[Problematic Use of Artificial Intelligence (AI) for Learning among STIT Pemalang Students]*	The results of research at STIT Pemalang indicate that the use of *Artificial Intelligence* (AI) by students has caused a series of significant problems. The three main issues identified include the increasing practice of plagiarism, the erosion of critical thinking skills, and the degradation of students' academic skills due to dependence on technology.
(Sinaga, 2024)	Peran dan Tantangan Penggunaan AI (Artificial Intelligence) Dalam Pembelajaran Matematika *[The role and challenges of using AI (Artificial Intelligence) in learning mathematics]*	The application of AI in mathematics learning faces three main challenges: privacy and ethical issues, limited access to technology, and the need for curriculum adaptation.
(Nurmilah, 2024)	Problematika Penggunaan Artificial Intelligence pada Mahasiswa Universitas PGRI Jombang *[Problematic Use of Artificial Intelligence in PGRI University Students in Jombang]*	It can be concluded that the use of AI among students of PGRI Jombang University brings many problems. The three main negative impacts are the increase in plagiarism, the decline in critical thinking skills, and the decline in student academic performance.
(Siliwangi, 2024)	Problematika Penggunaan Generative Artificial Intelligence (Ai) Pada Siswa Smk Dalam Keterampilan Menulis Pembelajaran Bahasa Indonesia *[Problematic Use of Generative Artificial Intelligence (AI) in Vocational Students in Indonesian Learning Learning Skills]*	The adverse impact of using AI is that students become lazy to think for themselves. They no longer want to try to find and develop their own ideas or ideas, because it is easier to ask for answers from AI.
(Basha & Ijssc, 2024)	The Negative Impacts of AI Tools on Students in Academic and Real-Life Performance	Constant reliance on AI in studies can have a negative impact on students. This risks weakening their basic abilities and critical thinking skills. As a result, students become more academically passive and potentially blunt in taking on challenges and solving real-world problems.
(Saisubramanian et al., 2021)	Understanding User Attitudes towards Negative Side Effects of AI Systems	The negative impact of this AI harms users, either directly or indirectly, because it violates their wishes and changes their environment in a dangerous direction.
(Chen & Lin, 2024)	Artificial intelligence as a double-edged sword: Wielding the POWER principles to maximize its positive effects and minimize its negative effects	In the world of education, the presence of AI is sparking debate. On the one hand, AI is praised for its ability to streamline the teaching and learning process. On the other hand, there are major concerns regarding the risk of abuse and over-reliance on this technology.
(Abbas et al., 2024)	Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students	The use of ChatGPT turns out to be at risk of giving rise to bad habits such as procrastination (procrastination) and weakening memory. The follow-up impact is a decline in the academic performance of students.
(Gocen & Aydemir, 2020)	Artificial Intelligence in Education and Schools	In general, views of AI tend to be positive. However, teachers and academics have voiced particular concerns about its negative impact on the future of the teaching profession.

(Lehmann et al., 2024)	AI Meets the Classroom: When Does ChatGPT Harm Learning?	When students use LLMs to work on assignments, they may be able to cover more material, but their understanding of each material becomes more simplistic.
(Pisica et al., 2023)	Implementing Artificial Intelligence in Higher Education: Pros and Cons from the Perspectives of Academics	The cause of this situation could be due to the lack of a clear strategic view of the meaning and process of implementing AI in higher education. Another factor is the level of digitalization in Romania, both in the university sector and in the economy, which is still in its infancy.
(Abarzosa & Balaba, 2025)	The Negative Effects of Over - Reliance on AI Tools in IT Student Learning	Although AI tools speed up work, their use risks lowering the level of thinking (cognitive) engagement of its users.

3.2 Discussion

Based on the analysis of various studies, a series of significant problems related to the use of AI in education were found. One of the key findings is that over-reliance on AI can decrease students' critical thinking skills and creativity, as they tend to pick up instant answers without going through an in-depth analysis process (Firdaus et al., 2025; Abbas et al., 2024). This is confirmed by another study conducted by Firdaus et al. (2025) showing that the uncontrolled use of AI triggers a decline in students' analytical skills and creativity in doing academic assignments. Similar findings were revealed by Lukman et al. (2024), who identified three main problems among students, namely the increase in plagiarism practices, the erosion of critical thinking skills, and the decline in academic skills due to dependence on technology. Another bad impact is that students become lazy to think on their own and no longer want to try. According to Siliwangi (2024), it shows that students become lazy to develop their ideas because they are used to the convenience offered by AI. This dependence risks weakening students' basic abilities, making them more passive academically, and potentially less skilled at solving real-world problems in the outside world (Basha & Ijssc, 2024).

In particular, the specific use of ChatGPT was also found to be at risk of procrastination and weakening memory, which leads to decreased academic performance (Abbas et al., 2024; Lehmann et al., 2024). Although AI has been proven to speed up the process of completing tasks, conceptual and reflective thinking processes tend to be overlooked. Students may access more material, but the understanding gained becomes more superficial (Lehmann et al., 2024). Although AI tools can speed up task completion, their use risks lowering the level of thinking (cognitive) engagement of its users. This is in line with the finding that when students use AI to work on assignments, they may be able to cover more material, but their understanding of each material becomes more shalline. The presence of AI in the world of education has sparked debate; on the one hand AI is praised for its efficiency, but on the other hand there are major concerns regarding the risk of abuse and over-dependence. Teachers and academics in particular have voiced concerns about the negative impact of AI on the future of the teaching profession (Chen & Lin, 2024; Gocen & Aydemir, 2020).

The challenges of AI implementation also come from various sides. A study by Maulidya & Insani (2024) shows that there is a digital competency gap among teachers caused by the lack of professional development programs such as training or workshops. This is strengthened by the findings of Sinaga (2024), who noted that the integration of AI in mathematics learning is still hampered by privacy issues, limited technological infrastructure, and suboptimal curriculum adjustments. In addition, the application of AI in mathematics learning faces other challenges such as privacy and ethical issues, limited access to technology, and the need for curriculum adaptation. At the institutional level, this problem can be caused by the lack of a clear strategic view of the process of implementing AI in higher education as well as the fact that the level of digitalization in some regions is still in its infancy. A contradiction also emerges, where high school students show high satisfaction with AI, but the frequency of its use in schools is minimal, which suggests that the learning environment has not yet fully supported the integration of this technology. More broadly, the negative impact of AI can be detrimental to users, both directly and indirectly, as it has the potential to violate their wishes and change the environment in a dangerous direction.

Based on an in-depth analysis of the findings, this final discussion brings together various problems of using AI in a complete framework. Consistently, the literature highlights a fundamental paradox: on the one hand, AI is praised for its ability to facilitate faster completion of tasks and streamline the teaching and learning process, but on the other hand, this ease triggers a series of significant negative impacts. The most often highlighted consequence is the erosion of students' cognitive and academic abilities. Reliance on AI has been shown to decrease critical thinking and creativity skills, weaken memory, and generally make students lazy to think on their own because they are used to getting instant answers. This phenomenon creates an exchange, where students may be able to cover more material, but their understanding of each topic

becomes more superficial. The symptoms of this skill degradation manifest themselves in the form of increased plagiarism practices and deterioration in academic performance.

This problem is not only rooted in individual students, but also in the readiness of the education ecosystem itself. Various studies show that there are systemic challenges that hinder healthy AI integration. This includes a digital competency gap among teachers exacerbated by the lack of professional development programs, as well as the urgent need to adapt the curriculum to be relevant to the presence of AI. Furthermore, at the institutional level, it is often found that there is a lack of a clear strategic vision regarding the meaning and objectives of AI implementation in higher education, a condition complicated by the fact that digital infrastructure in some regions is still in its infancy. The contradiction between the high level of student satisfaction with AI and the lack of integrated use in schools is a clear-evidence of this gap. Ultimately, all of these issues contribute to a broader concern that without wise management, AI can change the learning environment in undesirable and potentially harmful directions.

4. CONCLUSION

Based on the results of the analysis and discussion of relevant literature, it can be concluded that the use of artificial intelligence (AI) in mathematics learning at the high school level presents multifaceted and systemic problems. Broadly speaking, these problems can be grouped into two main categories. First, at the student level, the consistent use of AI has been shown to be at risk of lowering cognitive and academic abilities. This is manifested in the form of weakening critical thinking and creativity skills, reluctance to develop ideas independently, and increasing academic integrity issues such as plagiarism. Second, at the institutional and educator levels, AI integration is hampered by various structural and pedagogical challenges. These challenges include the digital competency gap among teachers caused by the lack of training programs, constraints in the availability of technology access, privacy and ethical issues, and the urgent need for curriculum adaptation. Furthermore, it was found that there is a paradox where students' satisfaction and positive perception of AI is not balanced by the high frequency of use in the school environment, which indicates significant implementation barriers.

IMPLICATION

These findings have important implications for stakeholders in the world of education. For teachers, the challenge is to move from conventional teachers to facilitators who can guide students in using AI critically and ethically. For educational institutions, it is a must to organize effective professional development for teachers and formulate clear policies related to the use of AI. Finally, for governments and curriculum developers, there is a need to review and adapt the curriculum to not only be relevant to technological developments, but also equip students with skills that are not easily replaced by machines.

RECOMMENDATION

Based on these conclusions, several suggestions were proposed, namely the following: For educational practice, schools need to proactively hold workshops and training for teachers to improve digital literacy and pedagogical skills in integrating AI. In addition, teachers are encouraged to develop assessment models that focus on the reasoning and problem-solving process, not just the final answer. For further research, longitudinal studies are needed to understand the long-term impact of AI use on students' cognitive development. Research that focuses on the development and testing of AI-based mathematics learning models that are effective and appropriate to the educational context in Indonesia is also highly recommended to bridge the gap between potential and existing problems.

REFERENCES

Abarzosa, V. J., & Balaba, E. I. (2025). *The Negative Effects of Over - Reliance on AI Tools in IT Student Learning*. *2*, 20–29.

Abbas, M., Jam, F. A., & Khan, T. I. (2024). Is it Harmful or Helpful? Examining the Causes and Consequences of Generative Ai Usage Among University Students. *International Journal of Educational Technology in Higher Education*, *21*(1). https://doi.org/10.1186/s41239-024-00444-7

Ahsanul In'am, M. D., Zukhrufurrohmah, Z., & Ernawati, S. (2024) -*Jurnal Pendidikan Profesi Guru*, Vol. 4(3)

Arissona Dia Indah Sari, A. D. I. S., Tatang Herman, Wahyu Sopandi, & Al Jupri. (2023). A Systematic Literature Review (SLR): Implementasi Audiobook Pada Pembelajaran di Sekolah Dasar. *Jurnal Elementaria Edukasia*, *6*(2), 661–667. https://doi.org/10.31949/jee.v6i2.5238

Auna, H. S. A., & Hamzah, N. (2024). Studi Perspektif Siswa Terhadap Efektivitas Pembelajaran Matematika Dengan Penerapan Chatgpt. *HINEF : Jurnal Rumpun Ilmu Pendidikan*, *3*(1), 13–25. https://doi.org/10.37792/hinef.v3i1.1160

Basha, J. Y., & Ijssc. (2024). The Negative Impacts of AI Tools on Students in Academic and Real-Life Performance. *J. Yunus Basha/IJSSC*, *1*(3), 1–16. https://doi.org/10.51470/ijssc.2024.01.03.01.

Chen, J. J., & Lin, J. C. (2024). Artificial Intelligence as A Double-Edged Sword: Wielding The POWER Principles To Maximize Its Positive Effects And Minimize Its Negative Effects. *Contemporary Issues In Early Childhood*, *25*(1), 146–153. https://doi.org/10.1177/14639491231169813

Deguchi, A., Hirai, C., Matsuoka, H., Nakano, T., Oshima, K., Tai, M., Tani, S., Shibasaki, R., Hori, S., Kawamura, S., Akashi, Y., Hato, E., Ohkata, J., Warisawa, S., Nakajima, T., Ohashi, H., Watanabe, T., Karasawa, K., & Sameshima, S. (2020). *Society 5.0: A People-Centric Super-Smart Society, Spinger Open 2020.* https://library.oapen.org/bitstream/handle/20.500.12657/41719/2020_book_society50.pdf?sequenc#page=59

Febrianti, S. (2024). Sustainability Finance Dan Green Investment: Literature Review Dengan Metode Prisma. *Manajemen: Jurnal Ekonomi*, *6*(1), 95–106. https://doi.org/10.36985/pmyj1709

Firdaus, J. A., Ummah, R. I., Aprialini, R. R., & Faizin, A. (2025). *Ketergantungan Penggunaan Kecerdasan Buatan (AI) Pada Tugas Akademik Mahasiswa Terhadap Kemampuan Berpikir Kritis Dan Kreatif. 14*(1), 1203–1214.

Gocen, A., & Aydemir, F. (2020). Artificial Intelligence In Education And Schools. *Research On Education And Media*, *12*(1), 13–21. https://doi.org/10.2478/rem-2020-0003

Januar, M., & Burhan, I. (2024). *Peran AI Dalam Pembelajaran Matematika (Flipp Classroom dan Aplikasi Penunjangnya) The Role of AI in Mathematics Learning (Flipp Classroom And Its Supporting Applications). 9*(3), 721–729.

Khanal, S., Zhang, H., & Taeihagh, A. (2024). Why and How is the Power of Big Tech Increasing in the Policy Process? The Case Of Generative AI. *Policy And Society*, *44*(March 2024), 52–69. https://doi.org/10.1093/polsoc/puae012

Lehmann, M., Cornelius, P. B., & Sting, F. J. (2024). *AI Meets The Classroom: When Does Chatgpt Harm Learning ?* 1–40.

Lukman, L., Riska Agustina, & Rihadatul Aisy. (2024). Problematika Penggunaan Artificial Intelligence (AI) Untuk Pembelajaran di Kalangan Mahasiswa STIT Pemalang. *Madaniyah*, *13*(2), 242–255. https://doi.org/10.58410/madaniyah.v13i2.826

Machmudah, N. H., & Cholis, H. (2023). Implementasi Program Kampus Mengajar Angkatan 5 Dalam Meningkatkan Kemampuan Literasi Dan Numerasi Hingga Adaptasi Teknologi Pada SDN Gunungsari I/484 Surabaya. *Prosiding Seminar Nasional Manajemen dan Ekonomi*, *2*(1), 171–180.

https://ukitoraja.id/index.php/semnas/article/download/168/158

Maulidya, S. R., & Insani, S. U. (2024). *Pemanfaatan Articial Intelligence (AI) Dalam Pembelajaran SMP. 3*(2), 56–59.

Nurmilah, R. (2024). *Problematika Penggunaan Artificial Intelligence Pada Mahasiswa Universitas PGRI Jombang. 6*(4), 10–12. https://doi.org/10.37034/infeb.v6i4.1066

Pisica, A. I., Edu, T., Zaharia, R. M., & Zaharia, R. (2023). Implementing Artificial Intelligence In Higher Education: Pros And Cons From The Perspectives Of Academics. *Societies*, *13*(5), 1–13. https://doi.org/10.3390/soc13050118

Ratnasari, M. R., Zabeta, F. Z., & Sholeha, F. Z. (2024). Jurnal *Algoritma: Jurnal Matematika, Ilmu Pengetahuan Alam, Kebumian Dan Angkasa*, Vol. 3(1), Hlm. 68–76.

Saisubramanian, S., Roberts, S. C., & Zilberstein, S. (2021). Understanding User Attitudes Towards Negative Side Effects of AI Systems. *Conference On Human Factors in Computing Systems-Proceedings*, *1*(1), 1–9. https://doi.org/10.1145/3411763.3451654

Sari, D. P., Alinurdin, & Salwa Alifah, R. P. (2025) *Jurnal Pancasila Dan Kewarganegaraan (JUPANK)*, Vol. 5(1)

Siliwangi, I. (2024). *Problematika Penggunaan Generative Artificial Intelligence (Ai) pada Siswa SMK dalam Keterampilan Menulis Pembelajaran Bahasa Indonesia. 4*(4), 235–241.

Sinaga, M. (2024). *Peran Dan Tantangan Penggunaan AI (Artificial Intelligence) Dalam Pembelajaran Matematika. 1*, 2024. https://ejournal.ummuba.ac.id/index.php/snkp/hm

Suariqi Diantama. (2023). Pemanfaatan Artificial Intelegent (AI) Dalam Dunia Pendidikan. *Dewantech Jurnal Teknologi Pendidikan*, *1*(1), 8–14. https://doi.org/10.61434/dewantech.v1i1.8

Sya'idan, T., & Ali, M. (2025). *Penciptaan Animasi Frame by Frame sebagai Media Promosi Universitas Potensi Utama. 4*(2), 381–394. https://doi.org/10.55123/sosmaniora.v4i2.5209

Vela, D., Sharp, A., Zhang, R., Nguyen, T., Hoang, A., & Pianykh, O. S. (2022). Temporal Quality Degradation In AI Models. *Scientific Reports*, *12*(1), 1–12. https://doi.org/10.1038/s41598-022-15245-z

Yasmin, A. D., & Yoto, Y. (2023). AR-Learning: Media Pembelajaran Berbasis Mobile Dengan Visualisasi 3 Dimensi Sebagai Upaya Untuk Meningkatkan Critical Thinking Siswa. *Jurnal Kependidikan*, *12*(4), 751–760. https://jurnaldidaktika.org

Yuliastuti, R., Norfalah, E., & Faustina Islami, I. (2024). *Combinatorial Thinking: How AI Relevance To Mathematics Learning Models*.