

GENERATIVE ARTIFICIAL INTELLIGENCE AS A SHADOW TEACHER: IMPLICATIONS FOR TEACHERS' PEDAGOGICAL AUTHORITY IN EDUCATION

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Abstract

The development of generative artificial intelligence in education has brought about significant transformations in learning practices, particularly through its emergence as a shadow teacher capable of providing explanations, feedback, and learning materials instantly. This situation has given rise to new problems related to the shift in teachers' pedagogical authority, both in epistemic, relational, and normative aspects in formal classrooms. This study aims to analyze the impact of the use of generative AI on teachers' pedagogical authority and identify the opportunities and challenges it poses in the contemporary educational context. This study uses a qualitative approach with a literature review method, which includes data collection through searching reputable journal articles, academic books, research reports, and education policy documents relevant to the topic of AI and pedagogy. Data analysis techniques used thematic and comparative analysis to identify patterns, trends, and differences in expert views. Data validity was maintained through evaluation of source credibility, reference recency, and argument consistency, while triangulation was carried out by comparing findings from various types of sources and disciplinary perspectives. The results of the study indicate that generative AI has the potential to shift teachers' pedagogical authority from the center of knowledge transmission to the role of facilitator, learning curator, and value builder, but not completely replace the role of the teacher. Pedagogical authority is actually undergoing a redefinition, demanding stronger pedagogical, ethical, and digital literacy competencies. This research implies the importance of developing teacher education and training policies that are adaptive to the integration of AI in a critical, humanistic manner, and oriented toward strengthening teachers' strategic role in the digital learning ecosystem.

Keywords: *Generative Artificial Intelligence, Teacher Pedagogical Authority, Digital Education*

Abstrak

Perkembangan kecerdasan buatan generatif dalam dunia pendidikan menghadirkan transformasi signifikan terhadap praktik pembelajaran, khususnya melalui kemunculannya sebagai guru bayangan yang mampu menyediakan penjelasan,

umpan balik, dan materi belajar secara instan. Kondisi ini memunculkan problematika baru terkait pergeseran otoritas pedagogis guru, baik dalam aspek epistemik, relasional, maupun normatif di ruang kelas formal. Penelitian ini bertujuan untuk menganalisis dampak penggunaan AI generatif terhadap otoritas pedagogis guru serta mengidentifikasi peluang dan tantangan yang ditimbulkannya dalam konteks pendidikan kontemporer. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi literatur, yang mencakup pengumpulan data melalui penelusuran artikel jurnal bereputasi, buku akademik, laporan penelitian, dan dokumen kebijakan pendidikan yang relevan dengan topik AI dan pedagogi. Teknik analisis data dilakukan melalui analisis tematik dan komparatif untuk mengidentifikasi pola, kecenderungan, serta perbedaan pandangan para ahli. Keabsahan data dijaga melalui evaluasi kredibilitas sumber, keterbaruan referensi, serta konsistensi argumen, sedangkan triangulasi dilakukan dengan membandingkan temuan dari berbagai jenis sumber dan perspektif disiplin. Hasil penelitian menunjukkan bahwa AI generatif berpotensi menggeser otoritas pedagogis guru dari pusat transmisi pengetahuan menuju peran fasilitator, kurator pembelajaran, dan pembina nilai, namun tidak sepenuhnya menggantikan peran guru. Otoritas pedagogis justru mengalami redefinisi yang menuntut kompetensi pedagogik, etis, dan literasi digital yang lebih kuat. Penelitian ini berimplikasi pada pentingnya pengembangan kebijakan pendidikan dan pelatihan guru yang adaptif terhadap integrasi AI secara kritis, humanis, dan berorientasi pada penguatan peran strategis guru dalam ekosistem pembelajaran digital.

Kata Kunci: *Kecerdasan Buatan Generatif, Otoritas Pedagogis Guru, Pendidikan Digital*

INTRODUCTION

The development of generative artificial intelligence (AI) in education represents a phase of multidimensional pedagogical transformation, encompassing technological, structural, and epistemological aspects. Generative AI is no longer understood solely as a learning aid, but rather as a quasi-pedagogical entity with the capacity to adaptively present conceptual explanations, provide instant feedback, and produce personalized learning materials tailored to the needs, learning styles, and ability levels of students. In an implementation context, generative AI often acts as a "shadow teacher" with a continuous presence outside the formal classroom. This phenomenon not only expands access to learning resources and flexibility in learning time but also encourages a paradigm shift from conventional knowledge transmission patterns to a more interactive, reflective, and learner-centered learning ecosystem. (Riska et al., 2025).

The use of generative artificial intelligence in the learning process presents great opportunities in increasing efficiency, accessibility, and pedagogical innovation (Tenberga & Daniela, 2024). However, this technological integration also raises fundamental issues related to power relations and pedagogical authority in the classroom. Epistemologically, generative AI's ability to access, process, and present information quickly, systematically, and seemingly objectively has the potential to displace teachers as the primary source of knowledge. When students

receive instant and comprehensive answers from AI, a tendency arises to view the technology as superior to the scientific authority of educators (Irawan et al., 2023). This condition can influence students' perceptions of the legitimacy of the knowledge conveyed by teachers, while also challenging the traditional structure of learning that places teachers as the center of epistemic authority.

This shift marks a new challenge for the world of education in maintaining the strategic role of teachers amidst the development of digital technology. Teachers can no longer be positioned solely as transmitters of information, but rather as pedagogical actors whose function is to interpret, contextualize, and critically validate knowledge. In this context, a teacher's authority lies in their pedagogical, ethical, and reflective abilities in guiding students to deeply understand information, rather than simply consume it. Teachers play a crucial role in directing the use of AI so that it aligns with educational values, learning objectives, and the development of student character (Kaafah, 2022). Thus, generative AI should be positioned as a supporting instrument, not a substitute for the teacher's pedagogical authority.

Beyond the epistemic dimension, the challenges posed by generative artificial intelligence also emerge in the relational and normative realms of learning. The intensity of students' interactions with AI systems has the potential to shift their dependence from direct teacher guidance to impersonal digital resources. This situation risks weakening the educational relationship that has long been the foundation of humanistic education, namely a dialogical relationship rich in values, empathy, and role models. Yet, teachers function not solely as academic facilitators but also as agents of value socialization, moral guides, and authoritative figures in the formation of students' character. Unlike teachers, generative AI operates based on computational algorithms that are instrumental and value-free. Therefore, its presence raises normative issues that touch on the philosophical dimension of education, particularly regarding moral authority and ethical responsibility in the learning process (Bahri, 2024).

In the context of formal education, the shift in pedagogical relationships and authority resulting from the development of artificial intelligence has direct implications for classroom learning practices. Teachers are no longer positioned as the sole source of knowledge, but rather as one of the actors interacting with intelligent digital systems capable of presenting information quickly, broadly, and adaptively. This situation demands a redefinition of the teacher's role, from mere transmitters of material to facilitators of learning, directors of critical thinking processes, and interpreters and managers of information. Teachers are required to guide students in sorting, evaluating, verifying, and contextualizing information obtained from AI to align it with learning objectives (Kadarisman et al., 2022). Without these competencies, the use of AI has the potential to reduce the pedagogical role of teachers and blur the line between deep, reflective learning and shallow, instant information consumption.

The use of generative artificial intelligence (AI) in educational contexts without a clear pedagogical and ethical framework has the potential to have serious

implications. One example is the decline of teachers' professional autonomy and the weakening of students' academic integrity. Excessive reliance on instant answers generated by AI can hinder the internalization of knowledge and reduce students' opportunities to develop critical, reflective, analytical, and creative thinking skills, which are fundamental goals of education. Furthermore, the legitimacy and authority of teachers as central actors in the learning process are at risk of being eroded if AI integration is not systematically designed and implemented (Puji et al., 2025). Therefore, the use of generative AI must be placed within a comprehensive pedagogical regulatory framework that reaffirms the strategic role of teachers. Technology integration should be complementary, not substitutive, so that AI functions as a tool that strengthens the learning process and supports the formation of students' knowledge, values, and character.

Several opportunities can be identified from the use of generative AI in learning, particularly in improving the effectiveness and differentiation of instruction. AI enables teachers to manage heterogeneous classes by providing supplementary materials, adaptive exercises, and early feedback that can be used as a basis for further learning. However, these opportunities are not without serious challenges, such as the risk of plagiarism, decreased critical thinking skills in students, and blurred boundaries of academic responsibility. Another equally significant challenge is the lack of digital pedagogical literacy among teachers in utilizing AI reflectively and ethically. Therefore, strengthening teachers' competencies in understanding the characteristics, limitations, and pedagogical implications of AI is a key prerequisite for this technology to function as a constructive pedagogical partner (Mahmud, 2022).

Several previous studies have shown that the use of generative AI in education has an ambivalent impact on the role of teachers. A study by Holmes et al. (2022) found that AI can improve learning efficiency, but has the potential to diminish the teacher's role as an epistemic authority if not pedagogically integrated. Research by Zhai (2023) showed that students tend to trust AI answers more than teacher explanations, especially in task-based learning contexts. Meanwhile, Kasneci et al. (2023) emphasized that generative AI can strengthen the role of teachers when used as a tool for reflection and learning enrichment. These findings emphasize that the impact of AI on teachers' pedagogical authority is highly dependent on the framework of use, digital literacy, and the institutional policies that govern it. The main weakness of previous research lies in the lack of comprehensive analysis across epistemic, relational, and normative dimensions. The novelty of this study lies in its attempt to integrate these three dimensions to holistically re-read teachers' pedagogical authority in the digital education ecosystem.

This research aims to critically analyze the implications of the use of generative artificial intelligence on teachers' pedagogical authority in the context of

contemporary education. This study specifically focuses on how generative AI influences the role and position of teachers in the epistemic, relational, and normative dimensions of the learning process. On the one hand, generative AI offers significant opportunities to promote pedagogical innovation, personalized learning, and efficient classroom management. However, on the other hand, its presence also presents serious challenges that have the potential to shift the authority of teachers as the primary source of knowledge, moral guide, and director of educational interactions. By using an analytical-conceptual approach, this research is expected to provide theoretical contributions to the development of digital education discourse, while also serving as a practical reference for educators and policymakers in formulating AI integration strategies that emphasize strengthening, rather than substituting, teachers' pedagogical authority.

METHOD

This research uses a qualitative approach with library research as the primary methodological framework for data collection and processing. This approach was chosen because it is relevant to examining the concepts, theories, and empirical findings developing in academic discourse on artificial intelligence and its implementation in education. The research data were obtained through a systematic search of various scientific sources, such as reputable national and international journal articles, academic books, research reports, and education policy documents (Sugiyono, 2017). Source searches are carried out in a structured manner, taking into account the suitability of the topic, the credibility of the author and publishing institution, and the level of recency of the publication (Robert K. Yin, 2018). Thus, the sources used are expected to be able to provide a comprehensive picture of the latest developments in AI integration in pedagogical practice.

The data collection process was conducted selectively and continuously to ensure that the analyzed literature had academic relevance and significant theoretical contributions. Each source was critically reviewed to identify conceptual foundations, conceptual frameworks, and key findings related to the use of artificial intelligence in learning. Furthermore, educational policy documents were analyzed to understand the direction of regulations and institutional strategies in responding to the development of AI technology. This combination of theoretical and policy sources enabled the research to capture not only conceptual discourse but also its practical implications in the educational context (Lexy J. Moleong, 2018). With this approach, this research is expected to be able to provide a solid conceptual basis for in-depth analysis and discussion.

Data analysis in this study was carried out systematically through thematic and comparative analysis approaches. Thematic analysis was used to identify and classify key themes, argumentation patterns, and conceptual tendencies emerging in various relevant literature sources. Meanwhile, comparative analysis was applied to compare theoretical perspectives, methodological approaches, and research findings of experts from various disciplines. Data validity was maintained through a

critical evaluation of the logical consistency of arguments, depth of analysis, and the appropriateness of the theoretical framework and the study context (Matthew B. & A. Michael, 2014). In addition, data triangulation was carried out by comparing findings from reputable journal articles, academic books, and policy documents, so as to obtain a comprehensive understanding and minimize the potential for interpretative bias in the research analysis process (Pola Anto et al., 2014).

FINDINGS AND DISCUSSION

The development of generative artificial intelligence (AI) has brought about significant transformations in the contemporary educational landscape, particularly in terms of the construction and legitimacy of teachers' pedagogical authority. The ability of generative AI to provide information instantly, explain concepts systematically, structure learning materials, and provide rapid and personalized feedback has challenged the traditional position of teachers as the primary source of knowledge in the classroom (Fakhrurridha et al., 2025). This situation has triggered a shift in the relationship between teachers, students, and learning resources, moving from a hierarchical pattern to a more open, collaborative, and multidimensional one. However, the presence of AI does not necessarily eliminate the role of teachers, but rather encourages a redefinition of pedagogical authority that no longer relies solely on information acquisition, but rather on the teacher's capacity to design, facilitate, and manage a meaningful learning process oriented toward developing students' competencies, character, and critical thinking (Suratin, et al., 2024).

The transformation of learning in the digital era demands a new understanding of the role of teachers within the entire educational ecosystem. Teachers are no longer positioned solely as transmitters of knowledge, but rather as directors, facilitators, and mediators of learning, guiding students in navigating the increasingly abundant and complex flow of information (Astuti et al., 2025). In this context, a teacher's pedagogical authority is not based solely on mastery of the material, but rather on their professional capacity to design meaningful learning objectives, select contextual strategies and methods, and facilitate reflective, critical, and ethical learning interactions. The presence of generative AI serves as a supporting instrument that expands access, personalization, and efficiency of learning. However, teachers retain normative and pedagogical control in determining the direction, depth, validity, and value of the ongoing learning process (Koehler et al., 2014).

From a modern pedagogical perspective, the presence of generative artificial intelligence (AI) does not necessarily replace the role of teachers, but rather emphasizes the urgency and significance of their role as primary facilitators in the learning process. Teachers are positioned as strategic actors with pedagogical authority to design and manage learning environments that are dialogic, contextual,

reflective, and oriented toward the needs and characteristics of students (B et al., 2024). This role includes the ability to critically and ethically integrate technology, develop problem-based and project-based learning, and stimulate higher-order thinking skills, such as critical, creative, communicative, and collaborative thinking. All of these dimensions cannot be comprehensively replicated by technology, as they require pedagogical sensitivity, social-emotional intelligence, and the ability to read situational, adaptive, and humanistic classroom dynamics (Rahmandani et al., 2025).

Thus, teachers' pedagogical authority in the era of artificial intelligence is not weakened, but rather undergoes a substantive and strategic transformation. Teacher authority no longer functions solely as a symbol of mastery and control over knowledge, but shifts toward a form of ethical, reflective, and transformative pedagogical leadership (Lilik Binti Mirnawati & Aswin Rosadi, 2025). In this context, teachers play a role as guarantors of human values, guardians of academic integrity, and facilitators who guide students in using technology critically, responsibly, and meaningfully. Therefore, the integration of generative artificial intelligence into educational practice should be understood as an opportunity to strengthen teacher professionalism and the quality of learning, not as a threat to the very existence of the teaching profession. This transformation also demands a comprehensive adjustment of the educational paradigm to maintain its orientation toward the formation of the whole person (Suryanto, 2024).

In addition to serving as facilitators, teachers have a strategic role as curators of learning amidst the massive flow of information generated by generative artificial intelligence technology. The information presented by AI is not entirely neutral and often contains bias, factual errors, and contextual inaccuracies, necessitating a rigorous selection and validation process (Firda Laila Syahda et al., 2024). In this position, teachers hold the epistemic authority to assess the credibility, relevance, and appropriateness of learning materials to students' needs and the socio-cultural characteristics of the learning environment. This curatorial role requires a comprehensive mastery of digital literacy, including an understanding of the working mechanisms of AI, its algorithmic limitations, and the pedagogical and ethical implications of its use (Suratin, et al., 2024). Without the active involvement of teachers as curators, the use of AI risks reducing the quality of learning and weakening students' critical thinking.

A teacher's pedagogical authority stems not only from mastery of the subject matter but also from their role as educators of students' values and character, a dimension that generative AI cannot replicate. Education, in essence, is not solely oriented toward the transfer of cognitive knowledge, but also toward the internalization of moral, ethical, spiritual, and national values. In the context of technological development, teachers bear a strategic responsibility to guide students in utilizing AI responsibly, honestly, and ethically, and to avoid academic practices that reduce integrity, such as plagiarism and over-reliance on technology (Ahmad Fauzi et al., 2025). Therefore, teachers serve as role models who instill

human values, wisdom, and responsibility in the use of technology. While AI can provide information and answers quickly, it lacks the capacity to shape students' character holistically and sustainably.

The redefinition of teachers' pedagogical authority in the era of generative artificial intelligence necessitates the strengthening of adaptive, reflective, and contextual pedagogical competencies. Teachers no longer act merely as transmitters of knowledge, but rather as facilitators and directors of learning processes aligned with the characteristics of digital native learners. Understanding students' learning patterns, needs, and interactions with technology is a key prerequisite for managing learning. Pedagogical competencies include the ability to design authentic assessments, facilitate collaborative learning, and develop project-based learning that emphasizes critical and reflective thinking processes (Mahmudulhassan et al., 2025). With professional pedagogical management, AI functions as a supporting instrument that strengthens the quality of learning and the relevance of the teacher's role.

In addition to pedagogical competence, strengthening ethical competence is a fundamental dimension in maintaining, affirming, and reproducing teachers' pedagogical authority amidst the massive integration of generative artificial intelligence into contemporary educational practices. The development of generative AI not only presents innovative opportunities in the design and implementation of learning but also raises a variety of complex ethical issues, such as the protection of student privacy and data security, the potential for algorithmic bias that has implications for learning injustice, and unequal access to digital technology. In this context, teachers are required to have sufficient ethical sensitivity, reflective capacity, and critical awareness to be able to interpret and utilize technology responsibly (Zhou et al., 2025). These ethical competencies serve as a normative basis for teachers in directing the use of AI to ensure it remains aligned with humanitarian values, principles of social justice, professional ethics, and national education goals.

Ethical competence places teachers in a strategic position as educators who not only transmit knowledge but also shape students' moral awareness and digital citizenship character. Teachers play a role in guiding students to understand the normative, social, and moral implications of the responsible and civilized use of artificial intelligence (Suratin, et al., 2024). Thus, a teacher's pedagogical authority does not stem solely from mastery of technology or learning methodology, but rather from moral integrity, professional commitment, and normative capacity to uphold educational values and ethics. This authority is irreplaceable, as it cannot be replaced by a machine system (Cukurova et al., 2025). Therefore, ethics is an essential foundation in building fair, humane, and responsible educational relationships between teachers, students, and AI technology.

Comprehensive digital literacy is a fundamental prerequisite for redefining teachers' pedagogical authority in the era of technological transformation. This literacy is not merely understood as the technical ability to operate artificial intelligence, but also encompasses a reflective and critical capacity for addressing the social, cultural, ethical, and pedagogical implications of the use of such technology (Mouta et al., 2025). Teachers with adequate digital literacy are able to position AI appropriately as a learning support tool, not as a source of absolute truth. Conversely, limited digital literacy has the potential to erode students' trust in their academic authority. Therefore, teacher professional development needs to be systematically and sustainably directed at strengthening contextual and adaptive digital literacy. (Ren & Wu, 2025).

Table. 1 Transformation of Teachers' Pedagogical Authority in the Era of Generative Artificial Intelligence

Transformation Aspects	The Role and Position of Teachers	Implications for Pedagogical Authority
Shifting Knowledge Sources	Teachers are no longer the sole source of information, but rather the directors and interpreters of the learning process amidst the instant availability of information from generative AI.	Pedagogical authority is undergoing a transformation from mastery of information to management of the learning process.
Teachers as learning facilitators	Teachers design dialogic, critical, and contextual learning environments, utilizing AI as a cognitive aid.	Teachers' authority is affirmed through their ability to manage meaningful and humanistic learning, not simply the transfer of knowledge.
Teachers as knowledge curators	Teachers select, validate, and adapt AI generated information to ensure it is relevant, accurate, and appropriate to the socio-cultural context of students.	Teachers' epistemic authority is strengthened as guarantors of the credibility and quality of learning materials.
Values and Character Development	Teachers instill moral, ethical, spiritual, and national values and guide the responsible use of AI.	Pedagogical authority stems from exemplary behavior and the capacity to shape character, which cannot be replaced by AI.
Strengthening pedagogical competencies	Teachers develop authentic assessments, collaborative learning, and project-based learning that align with the characteristics of digital native learners.	Teacher authority is strengthened through professionalism and adaptive skills in managing technology-based learning.
Strengthening Ethical Competence	Teachers guide students' ethical awareness regarding data privacy, algorithmic bias, and fairness in technology access.	Pedagogical authority rests on moral integrity and normative capacity in shaping responsible digital citizens.
Comprehensive digital literacy	Teachers critically and reflectively understand the working mechanisms of AI and the social, cultural, and pedagogical implications of its use.	Digital literacy strengthens the legitimacy of teachers' academic authority and prevents the dominance of technology as a source of absolute truth.

Based on the overall discussion, the presence of generative artificial intelligence (AI) in the educational realm does not necessarily eliminate teachers'

pedagogical authority, but rather reconfigures it into a more dynamic, complex, and meaningful form. In this context, teachers are no longer positioned solely as centers of knowledge transmission, but play a strategic role as learning facilitators, information curators, and fosterers of ethical and humanitarian values. Teachers' pedagogical authority is even more crucial in directing the use of AI so that it aligns with educational goals that are humanistic, critical, and oriented towards building student character. Therefore, the future of education is not determined solely by technological dominance, but by teachers' capacity to lead learning transformations reflectively, wisely, and responsibly.

CONCLUSION

The presence of generative artificial intelligence in education has significant implications for the reconceptualization of teachers' pedagogical authority. This authority no longer rests solely on the teacher's position as the center of knowledge transmission, but rather shifts toward a more strategic role as a facilitator of the learning process, curator of credible learning resources, and fosterer of human values and moral virtues. However, generative AI has fundamental limitations that prevent it from completely replacing the role of teachers, particularly in the affective, ethical, relational, and character-building dimensions of students. Therefore, teachers' pedagogical authority is not being eroded but is instead being redefined, requiring the strengthening of pedagogical competence, critical digital literacy, and ethical sensitivity in the use of technology. Within this framework, teachers remain key actors guiding the integration of AI to align with educational goals, human values, and the principles of holistic student development.

The findings of this study have strategic implications for the urgency of formulating and strengthening educational policies that are responsive to the integration of generative AI in a critical, contextual manner, and based on humanistic values. These policies need to be accompanied by ongoing training and professional development programs for teachers that focus on enhancing pedagogical capacity, strengthening digital ethics, and developing reflective skills in the responsible use of technology. Generative AI integration should be positioned as a supporting instrument for the learning process, not as a substitute for the essential pedagogical relationship between teachers and students. Therefore, further research is recommended to more comprehensively examine the long-term impact of generative AI use on the transformation of teachers' pedagogical authority, the quality of learning, and the formation of student character in the context of education in the digital era.

REFERENCES

Ahmad Fauzi, W. N., Setiawati, Y., Puji Hartono, D., Mahmudi, M. R., & Prayitno, M. (2025). AI Integrated Pedagogies in Primary Education: A Decade of Global

- Trends and Strategic Adaptation for Indonesia's Curriculum Transformation. *International Journal of Basic Educational Research*, 2(2), 57–70. <https://doi.org/10.14421/ijber.v2i2.11619>
- Bahri, S. (2024). Pengembangan Kompetensi Guru Dalam Literasi Digital Dan Etika Siber: Studi Interdisipliner Antara Pendidikan Dan Teknologi Informasi. *EduFalah Journal: Holistic Education Journal*, 01(03), 188–200.
- Cukurova, M., Suraworachet, W., Zhou, Q., & Bulathwela, S. (2025). Towards Synergistic Teacher-AI Interactions with Generative Artificial Intelligence. *Semantic Scholar*, 1–18. <https://doi.org/https://doi.org/10.48550/arXiv.2511.19580>
- Irawan, I., Aripin, J., & Priatna, T. (2023). Pengelolaan Sains dan Teknologi di Pesantren. *Jurnal Dirosah Islamiyah*, 5(2), 378–386. <https://doi.org/10.47467/jdi.v5i2.3293>
- Kaafah, S. S. (2022). Integrasi Teknologi Pada Pembelajaran Matematika Secara Daring Di Sma Berdasarkan Model Samr (Substitusi, Augmentasi, Modifikasi, Dan Redefinisi). *INSPIRAMATIKA: Jurnal Inovasi Pendidikan Dan Pembelajaran Matematika*, 8.
- Kadarisman, Marisa, Asnah M.N. Limbung, & Suryo Prabowo. (2022). Training on the Development of Utilization of Digital Teaching Materials for Teachers to Improve Student Learning Outcomes. *JTP - Jurnal Teknologi Pendidikan*, 24(3), 400–411. <https://doi.org/10.21009/jtp.v24i3.31799>
- Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2014). The technological pedagogical content knowledge framework. In *Handbook of Research on Educational Communications and Technology: Fourth Edition* (pp. 101–111). Springer New York. https://doi.org/10.1007/978-1-4614-3185-5_9
- Lexy J. Moleong. (2018). *Metodologi Penelitian Kualitatif*. Remaja Rosdakarya.
- Mahmud, R. (2022). *Pendidikan Islam Dalam Mengatasi Problema dan Tantangan Pembangunan Nasional* (Vol. 21, Issue 2).
- Mahmudulhassan, M., Abuzar, M., Khondoker, S. U. A., & Khanom, J. (2025). The Integration of Islamic Epistemology in Ethical and Multicultural Education: Pedagogical Strategies and Challenges. *Multicultural Islamic Education Review*, 2(2), 123–134. <https://doi.org/10.23917/mier.v2i2.7612>
- Matthew B., M., & A. Michael, H. (2014). *Qualitative Data Analysis: A Methods Sourcebook*. SAGE.
- Mouta, A., Torrecilla-Sánchez, E. M., & Pinto-Llorente, A. M. (2025). Comprehensive Professional Learning For Teacher Agency In Addressing Ethical Challenges Of AIED: Insights From Educational Design Research. *Education and Information Technologies*, 30(3), 3343–3387. <https://doi.org/10.1007/s10639-024-12946-y>
- Pola Anto, R., Nikmatullah Nur, Ms., Si, S., Sc Yusriani, M., Fenni Kurniawati Ardah, Mk., Juwita Desri Ayu, Sp., Adi Nurmahdi, Mk., Baiq Ahda Razula Apriyeni, M.,

- Purwanti, Ms., Narita Yuri Adrianingsih, M., & Miftah Fariz Prima Putra, Ms. (2014). *METODE PENELITIAN KUALITATIF: TEORI DAN PENERAPANNYA*.
- Puji, N., Santoso, L., Barasa, G., Ramadhan, D. N., Nugraha, M. T., & Parker, J. (2025). Religious Moderation in Islamic Education Through Social Media Based Learning for High School Students Moderasi dalam Pendidikan Islam Melalui Pembelajaran Berbasis Media Sosial untuk Siswa SMA. *Alfabet Jurnal Wawasan Agama Risalah Islamiah, Teknologi Dan Sosial (Al-Waarits*, 2(2), 61. <https://doi.org/10.34306/alwaarits.v2i2.878>
- Rahmandani, F., Trisakti Handayani, & Moh. Wahyu Kurniawan. (2025). Digital Literacy Improvisation in Improving Teacher's Pedagogical Competence. *Jurnal Pendidikan Dan Pengajaran*, 58(1), 39–49. <https://doi.org/10.23887/jpp.v58i1.83835>
- Ren, X., & Wu, M. L. (2025). Examining Teaching Competencies and Challenges While Integrating Artificial Intelligence in Higher Education. *TechTrends*, 69(3), 519–538. <https://doi.org/10.1007/s11528-025-01055-3>
- Riska, N., Rosmilawati, I., & Juansah, D. E. (2025). Integrasi Teknologi Ai Dalam Pembelajaran Adaptif Untuk Meningkatkan Keterampilan Abad 21 Di Sekolah Dasar. *Jurnal Inovasi Dan Teknologi Pendidikan JURINOTEP*, 4(1), 180–198. <https://doi.org/10.46306/jurinotep.v3i1>
- Robert K. Yin. (2018). *Case Study Research and Applications: Design and Methods*, 6th ed. Sage Publications.
- Sugiyono. (2017). *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D*. Alfabeta.
- Suratin, S. I., Prayogo, P., Munawarsyah, M., & Lestari, R. (2024). The Role of Islamic Education in Positive Social Transformation amidst Technological Advancements. *Journal of Islamic Education Studies* ISSN, 12(2), 223–242. <https://doi.org/10.15642/jpai.2024.12.2.223-242>
- Suratin, S. I., Rahmah Maulida, G., Fakhurridha, H., Indahsari, H. N., & Ike Yunida, H. (2024). Epistemologi: Imre Lakatos (Program Riset) dan Penerapan Metodologinya dalam Pendidikan Islam. *Mauriduna: Journal of Islamic Studies*, 5(2), 637–650. <https://doi.org/10.37274/mauriduna.v5i2.1265>
- Suryanto, D. (2024). Strategi Pembinaan Guru639. *Instructional Development Journal*, 7(3), 639–649. <http://ejournal.uin-suska.ac.id/index.php/IDJ>
- Zhou, X., Li, Y., Chai, C. S., & Chiu, T. K. F. (2025). Defining, Enhancing, And Assessing Artificial Intelligence Literacy And Competency In K-12 Education From A Systematic Review. *Interactive Learning Environments*, 33(10), 5766–5788. <https://doi.org/10.1080/10494820.2025.2487538>