

Islamic Religious Education in the Era of Artificial Intelligence: Opportunities, Challenges, and Ethical Implications

**Fatmawaty¹, Eni Elyati², Kartini³, Irfan Saputra⁴,
Ibrahim⁵**

^{1,4,5}Universitas Islam Negeri Raden Fatah Palembang, Palembang, Indonesia.

^{2,3}Sekolah Tinggi Agama Islam Rahmadiyah Sekayu, Musi Banyuasin, Indonesia.

email: fatmawaty@radenfatah.ac.id enielyati@gmail.com kartika123y@gmail.com
irfansaputra2344@gmail.com ibrahim_uin@radenfatah.ac.id

Article Info

Received:

26/9/2026

Accepted:

5/10/2026

Published:

20/10/2026

Abstract: This study aims to analyze the opportunities, challenges, and ethical implications of utilizing artificial intelligence (Artificial Intelligence/AI) in Islamic Religious Education (PAI) learning. The study is motivated by the increasing use of AI technology in providing learning resources, developing teaching materials, personalizing learning, providing feedback, and strengthening digital religious literacy. This study employs a qualitative approach with a literature review design. Data were obtained through an analysis of policy documents, academic publications, journal articles, and literature discussing AI in education, teacher competencies, technology ethics, and Islamic Religious Education learning. Data analysis was conducted through reduction, categorization, interpretation, and thematic synthesis focusing on three main aspects: opportunities, challenges, and ethical implications. The findings indicate that AI can support Islamic Religious Education learning that is more adaptive, interactive, contextual, and personalized. However, its implementation faces risks, including inaccuracies in religious information, algorithmic bias, student dependency, academic dishonesty, unequal access, and privacy violations.

Keywords: Artificial Intelligence, Digital Literacy, Learning, Islamic Religious Education

Abstrak: Penelitian ini bertujuan menganalisis peluang, tantangan, dan implikasi etis pemanfaatan kecerdasan buatan (Artificial Intelligence/AI) dalam pembelajaran Pendidikan Agama Islam (PAI). Kajian ini berangkat dari meningkatnya penggunaan teknologi AI dalam penyediaan sumber belajar, pengembangan bahan ajar, personalisasi pembelajaran, pemberian umpan balik, dan penguatan literasi keagamaan digital. Penelitian menggunakan pendekatan kualitatif dengan desain studi kepustakaan. Data diperoleh melalui analisis dokumen kebijakan, publikasi akademik, artikel jurnal, dan literatur yang membahas AI dalam pendidikan, kompetensi guru, etika teknologi, serta pembelajaran PAI. Analisis data dilakukan melalui reduksi, kategorisasi, interpretasi, dan sintesis tematik terhadap tiga fokus utama, yaitu peluang, tantangan, dan implikasi etis. Hasil kajian menunjukkan bahwa AI dapat mendukung pembelajaran PAI yang lebih adaptif, interaktif, kontekstual, dan personal. Namun, implementasinya menghadapi risiko ketidakakuratan informasi keagamaan, bias algoritmik, ketergantungan peserta didik, ketidakjujuran akademik, kesenjangan akses, dan pelanggaran privasi.

Kata Kunci: Kecerdasan Buatan, Literasi Digital, Pembelajaran, Pendidikan Agama Islam

Introduction

AI refers to artificial intelligence that can facilitate human work (Siahaan et al., 2020), in the context of education, the presence of AI can assist educators in developing

learning experiences that are more adaptive, interactive, and aligned with students' needs. UNESCO emphasizes that the use of AI in education should be directed toward strengthening human capacity, protecting students' rights, and improving the quality of human-centered learning (UNESCO, 2023).

The presence of AI offers several opportunities for the development of PAI learning. First, AI can assist teachers in providing more diverse learning resources that are appropriate to students' levels of ability. Second, AI technology can be used to develop personalized learning by providing exercises, explanations, and feedback tailored to the individual needs of students, while also enabling the values of Islamic Religious Education to be explored more deeply (Rofiq, 2022). Third, AI can support teachers in developing teaching modules, assessment questions, case studies, simulations, and contextual discussion materials. Fourth, AI can expand students' access to Islamic knowledge and scholarship in various languages and formats. With teacher supervision, such utilization has the potential to increase students' motivation, engagement, and creativity in learning PAI.

The next challenge concerns the decline in students' independence and critical thinking skills. Unstructured use of AI may encourage students to accept answers instantly without understanding the thinking process, comparing sources, or developing their own arguments. In PAI learning, this condition may reduce the depth of students' understanding of religious values because they become more focused on the final outcome than on the process of internalizing those values. UNESCO emphasizes that the use of AI should support the learning process and should not diminish cognitive abilities, human agency, or social relationships in education (UNESCO, 2021).

Other ethical aspects include the protection of personal data, algorithmic bias, unequal access to technology, system transparency, and responsibility for AI-generated outputs. Student data entered into AI platforms may potentially be used without adequate understanding of data security and privacy. Furthermore, AI systems are built on particular datasets that may not adequately represent the diversity of cultures, languages, traditions, and Islamic thought in Indonesia. When used without a critical perspective, AI may reinforce particular biases, oversimplify religious issues, or overlook local contexts. UNESCO identifies the protection of human dignity, justice, transparency, accountability, diversity, and human oversight as important principles in the development and use of AI (UNESCO, 2021).

Through the *AI Competency Framework for Teachers*, UNESCO identifies five dimensions of competencies that teachers need to develop: a human-centered mindset, AI ethics, AI foundations and applications, AI pedagogy, and AI for professional learning (Miao & Cukurova, 2024). This framework is relevant to PAI teachers because digital competence needs to develop alongside pedagogical competence, Islamic scholarly competence, and moral integrity. PAI teachers are not only required to be capable of using AI but must also be able to guide students in using technology responsibly, critically, inclusively, and in accordance with Islamic values.

Based on the foregoing discussion, examining Islamic Religious Education in the era of artificial intelligence is important. Such an examination should not view AI merely as a learning support tool but should also analyze its opportunities, challenges, and ethical implications for the objectives of Islamic education. The main focus should be directed toward how AI can be utilized to improve the quality of learning without diminishing the role

of teachers, scholarly authority, human values, academic responsibility, and the process of character and moral development. Thus, the integration of AI into PAI is expected to go beyond technical aspects and support the development of students who are knowledgeable, morally upright, critical thinkers, digitally literate, and capable of using technology in accordance with Islamic ethical principles.

Method

This study employs a qualitative approach with a literature review design or *library research* (Brutu et al., 2023; Ibrahim et al., 2022). A qualitative approach was selected because the study focuses on developing an in-depth understanding of the opportunities, challenges, and ethical implications of utilizing artificial intelligence in Islamic Religious Education. The literature review was conducted to identify, examine, compare, and synthesize various ideas and research findings relevant to AI, Islamic education, digital pedagogy, religious literacy, technology ethics, and teacher competencies. The data sources consisted of primary and secondary sources (Annur, 2018; Saat & Mania, 2019; Sugiyono, 2022). Primary sources included policy documents and official publications related to AI and education, such as *Guidance for Generative AI in Education and Research*, *Recommendation on the Ethics of Artificial Intelligence*, and the *AI Competency Framework for Teachers* published by UNESCO. Secondary sources included national and international journal articles, scientific proceedings, academic books, research reports, and policy documents addressing the use of AI in education, Islamic Religious Education, religious moderation, digital ethics, digital literacy, and learning assessment.

The data were analyzed using qualitative content analysis. The analysis was conducted by identifying concepts, themes, arguments, and patterns emerging from various sources (Ibrahim et al., 2023). The collected data were analyzed through three stages: data reduction, data presentation, and conclusion drawing. Data validity was ensured through source triangulation (Moleong, 2019; Sugiyono, 2021), triangulation was conducted by comparing information from international policy documents, journal articles, academic publications, and relevant research findings. Priority was given to sources originating from official institutions, scholarly journals, academic publishers, and publications that provide methodological information and clear references. In addition, information related to Islamic teachings, interpretations (*tafsir*), Hadith, or Islamic practices was verified through credible Islamic and academic sources.

Result and Discussion

Research Findings

Based on an analysis of various policy documents, academic publications, and literature on artificial intelligence in education, three main findings were identified. These findings concern the opportunities for utilizing AI in Islamic Religious Education (PAI) learning, the challenges of its implementation, and the ethical implications that need to be considered by teachers and educational institutions. Taken together, these findings indicate that AI has significant potential to support the transformation of PAI learning; however, its

use cannot be separated from the need for scholarly validation, teacher competence, student protection, and human oversight.

Opportunities for Utilizing AI in PAI Learning

AI offers significant opportunities to support the improvement of PAI learning through the provision of learning resources, the development of teaching materials, learning personalization, and feedback. Teachers can use AI to develop lesson plans, formulate learning objectives, generate various types of questions, develop case studies, simplify learning materials, and provide exercises based on students' ability levels. Such utilization can help teachers save time on administrative tasks and enable them to focus more on guiding, mentoring, and developing students' character.

Scholars have acknowledged the potential of AI in education, particularly its ability to provide student-engaging support and appropriate feedback (Abimanto & Mahendro, 2023). AI can also be utilized to strengthen digital religious literacy. Students can be trained to compare religious information from various sources, assess the credibility of references, identify biases, and distinguish between accountable information and provocative content. These abilities are particularly important because students live in an information environment that is rapid, open, and difficult to control. They need not only religious knowledge but also the ability to assess the quality of religious information encountered on the internet.

These findings are consistent with UNESCO's view that the use of AI in education should be directed toward strengthening human capacity, improving the quality of learning, and keeping humans at the center of the educational process (UNESCO, 2023). The AI competency framework for teachers also indicates that the use of technology should be supported by pedagogical competence, ethical understanding, and professional responsibility (Miao & Cukurova, 2024). Therefore, AI has the potential to support PAI learning that is more adaptive, interactive, dialogical, and contextual, provided that its use remains under appropriate teacher supervision.

Challenges in Implementing AI in Islamic Religious Education

Despite offering various opportunities, the implementation of AI in PAI learning faces a number of challenges. The first challenge concerns the accuracy and validity of religious information. Generative AI can produce answers that appear linguistically convincing but are not always supported by accurate sources. AI systems operate based on patterns within available data and do not always fully understand the theological, historical, social, and methodological contexts of religious issues.

The UNESCO competency framework identifies AI ethics, AI pedagogy, AI foundations, a human-centered mindset, and professional development as important competencies for teachers (Miao & Cukurova, 2024). In the context of PAI, these competencies need to be integrated with mastery of Islamic scholarship, the ability to critically examine religious sources, and an understanding of character education. Teachers must be able to assess whether AI-generated answers are consistent with credible Islamic sources and relevant to students' developmental needs.

In addition, there is the challenge of unequal access to devices and the internet. Not all students have adequate devices, stable internet connections, or the same level of digital competence. If AI use becomes a primary requirement in learning, students from

economically disadvantaged backgrounds may be placed at a disadvantage. Therefore, educational institutions need to consider the principle of equity and provide alternative learning options for students with limited access.

Ethical Implications of AI Utilization in PAI Learning

The use of AI in learning has the potential to transform the educational paradigm. When used wisely and responsibly, AI can improve the quality and accessibility of education by enabling students to learn in more personalized and effective ways (Wahyudinarti et al., 2024). The utilization of AI in Islamic Religious Education (PAI) has ethical implications for teacher authority, academic responsibility, data protection, equity, and character development. Educational institutions need to establish regulations governing the use of AI in assignments, examinations, research, and the development of teaching materials. Such regulations may include requirements to disclose the use of AI, prohibitions against entering personal data, requirements to verify information, and provisions specifying which types of assignments may or may not involve AI. These guidelines should be communicated to teachers, students, educational staff, and parents.

Another ethical implication concerns the protection of students' personal data. The use of AI platforms may involve identity information, learning outcomes, questions, activity records, and students' behavioral data. If such data are not managed appropriately, students may face risks of privacy violations, data misuse, or excessive monitoring. Therefore, teachers and educational institutions need to exercise caution when entering student data into AI systems. In addition to privacy concerns, AI systems may produce biases based on the data used in their development. Such biases may manifest in the neglect of cultural, linguistic, religious, or local contextual diversity. AI-generated responses concerning Islam may disproportionately represent certain perspectives and may not necessarily reflect the diversity of Islamic thought in Indonesia. If not critically examined, this situation may lead students to adopt narrow or decontextualized understandings.

UNESCO emphasizes the importance of protecting human dignity, justice, transparency, accountability, diversity, and human oversight in the use of AI (UNESCO, 2021). These principles are closely related to values in Islamic education, such as *amanah* (trustworthiness), justice, responsibility, *tabayyun* (verification of information), and *maslahah* (the common good). The principle of *tabayyun*, for example, can be applied by cultivating the habit of verifying the accuracy of information before accepting or disseminating it. The principle of *amanah* can be applied through the honest and responsible use of AI.

The findings also indicate that AI integration needs to be directed toward strengthening, rather than replacing, the human dimension of Islamic education. The values of exemplary conduct, *adab*, empathy, responsibility, tolerance, and character development require human interaction that cannot be completely replaced by algorithmic systems. AI can assist in explaining concepts related to *akhlak*, but it cannot replace the teacher's exemplary conduct in demonstrating honesty, patience, compassion, and respect for others.

Discussion

The research findings indicate that artificial intelligence or *Artificial Intelligence* (AI) presents both opportunities and risks for Islamic Religious Education (PAI). AI can help improve access to learning resources, accelerate the development of teaching materials,

provide feedback, and support personalized learning. However, its utilization cannot be understood merely as a technical matter. In PAI, AI intersects with the validity of religious knowledge, character development, teacher authority, academic responsibility, and student protection. Therefore, AI integration needs to be situated within a pedagogical and ethical framework that places humans at the center of education.

AI and the Transformation of PAI Learning

AI technology accelerates the learning process by providing rapid and broad access to relevant educational resources. AI helps students use their learning time more efficiently by providing relevant learning materials and adapting the pace of learning to individual needs (Wahyudinarti et al., 2024). In the context of PAI, AI technology can support a shift from teacher-centered learning toward more active and dialogical learning. Topics such as *akhlak*, *fiqh*, Islamic history, the Qur'an, Hadith, and religious moderation can be presented through simulations, quizzes, concept maps, problem scenarios, and interactive conversations. For example, students can analyze cases involving the dissemination of false information on social media by applying the Islamic principles of *tabayyun* (verification), honesty, responsibility, and the prohibition against spreading *fitnah* (slander). In such activities, AI functions as a tool for generating scenarios or preliminary perspectives, while the process of moral evaluation remains the responsibility of students under the guidance of the teacher.

This approach is consistent with the view that AI should be used to enhance human interaction and critical thinking rather than eliminate them. Meaningful use of AI requires teacher guidance so that students do not merely accept answers but also examine, revise, and reflect on AI-generated outputs (Lee & Low, 2024). In PAI learning, reflection is particularly important because religious knowledge needs to be connected with attitudes, behavior, and social responsibility.

Another strategic opportunity is the strengthening of digital religious literacy. Students need more than the ability to memorize religious material; they also need the ability to evaluate religious information circulating in digital spaces. AI can be used to compare several answers, identify differences of opinion, detect potential biases, and map sources that require verification. This process can foster critical thinking and careful judgment.

With the presence of AI or artificial intelligence, students can develop new ways of thinking and easily gain new perspectives and knowledge, which may influence students' character development in the learning process (Hasni et al., 2023). However, verification skills need to be developed through purposeful instruction. Teachers need to teach students how to examine religious evidence, consider the context of Qur'anic verses and Hadith, trace authorship, and distinguish between scholarly opinions, personal opinions, and information without a reliable basis. In this way, AI can serve as a means of strengthening the Islamic scholarly tradition, particularly the principle of *tabayyun*, rather than merely functioning as a tool for obtaining quick answers.

UNESCO emphasizes that AI in education should be used through a human-centered approach, strengthen educators' capacities, and preserve students' agency (UNESCO, 2023). This principle is highly relevant to the objectives of PAI because Islamic education is not merely intended to produce students who can answer questions but also individuals who possess moral awareness and social responsibility.

Challenges to Knowledge Validity and Teacher Readiness

In the era of Society 5.0, media have undergone significant development alongside advances in AI-based (Artificial Intelligence) technology and the increasingly internet-driven environment. These developments require teachers to be adaptive and quick to learn in responding to the challenges of changing times (Amaliah et al., 2024). The most serious challenge in the use of AI for PAI concerns the validity of religious knowledge. Generative AI can produce structured and convincing answers, but these answers are not always accurate. Such systems may generate fabricated references, quote verses or hadith incompletely, combine the opinions of different scholars, or present a particular viewpoint as though it were the only truth.

Teacher readiness is a determining factor in the successful integration of AI. Mastery of applications alone is insufficient. Teachers need to understand how to formulate prompts, assess the quality of outputs, identify bias, protect personal data, and design learning activities that encourage student engagement. UNESCO has developed a teacher competency framework encompassing a human-centered mindset, AI ethics, AI foundations and applications, AI pedagogy, and AI for professional development (UNESCO, 2024)

Challenges also emerge in students' learning patterns. AI may cause students to become accustomed to obtaining answers instantly. If this continues over time, their abilities to read, write, memorize, analyze, and construct arguments may decline. Research on AI in education has raised concerns about declining cognitive autonomy, academic integrity, and student engagement in the learning process (García-López & Trujillo-Liñán, 2025).

However, AI does not necessarily undermine academic integrity. Its impact depends on instructional design and policies governing its use. When AI is used as a shortcut for completing assignments, the risk of academic dishonesty increases. Conversely, when students are required to report their use of AI, examine its outputs, revise them, and provide written reflections, the technology can support deeper learning (Lee & Low, 2024).

Therefore, PAI assessment needs to shift from evaluating products toward evaluating processes. Teachers can employ presentations, dialogue, reflective journals, practical demonstrations, social projects, and oral examinations. Students can also be required to provide process notes, identify the sources they used, document their AI prompts, and explain the revisions they made to AI-generated outputs. Such an assessment model not only evaluates the final product but also students' thinking skills, honesty, and sense of responsibility.

Ethical Implications and the Human Oversight Model

The use of AI in PAI has ethical implications for teacher authority, privacy, fairness, bias, and character development. AI does not possess moral capacity, pedagogical experience, or religious responsibility. Therefore, AI cannot be treated as the sole authoritative source for addressing religious issues. Teachers remain responsible for ensuring that the materials used by students are accurate, contextually appropriate, and aligned with the objectives of Islamic education.

The use of AI as a learning assistant has significant potential to improve learning effectiveness, personalization, and student engagement (Hasni et al., 2023). The presence of AI does indeed transform the role of teachers, but it does not eliminate their authority.

Teachers no longer function merely as transmitters of information, but also as guides, source curators, validators, dialogue facilitators, and moral role models. From this perspective, teacher authority derives not merely from the amount of information they possess, but from their ability to provide meaning, judgment, and ethical guidance.

Privacy is another aspect that requires serious attention. AI platforms can process students' identities, learning outcomes, questions, and activity records. If such data are used without adequate protection, students may face risks of data breaches or excessive surveillance. UNESCO recommends data protection, independent evaluation, teacher training, and institutional oversight in the use of AI in schools (UNESCO, 2023). Schools and madrasahs need to develop guidelines concerning the use of AI in assignments, examinations, teaching materials, and research. Such guidelines may include requirements to disclose the use of AI, prohibitions on entering personal data, procedures for source verification, permitted forms of assessment, and sanctions for misuse. These policies should be communicated to teachers, students, parents, and educational staff.

Ultimately, AI in PAI should be directed toward strengthening the values of honesty, *amanah* (trustworthiness), *tabayyun* (verification), justice, tolerance, and *maslahah* (the common good). Technology can help explain concepts of *akhlak* (Islamic morals), but it cannot replace the teacher's exemplary conduct in demonstrating patience, empathy, responsibility, and care. Therefore, the success of AI in Islamic education should not be measured by how frequently the technology is used, but by the extent to which it helps develop students who are knowledgeable, critical, faithful, morally upright, and responsible.

Conclusion

The use of artificial intelligence in Islamic Religious Education offers significant opportunities to improve the quality, flexibility, and relevance of learning. AI can assist teachers in developing instructional materials, provide more personalized learning, enrich assessment methods, and strengthen students' digital religious literacy. However, its implementation faces challenges, including inaccuracies in religious information, limited teacher competencies, student dependency, academic dishonesty, unequal access, and risks of privacy violations. Therefore, AI should not be positioned as a replacement for teachers or as the sole authoritative source for understanding Islamic teachings. AI integration should be implemented critically, ethically, inclusively, and through a human-centered approach involving source validation, teacher oversight, data protection, and process-based assessment. Through such an approach, AI can support the development of students who are knowledgeable, critical thinkers, morally upright, responsible, and capable of utilizing technology for the common good.

References

- Abimanto, D., & Mahendro, I. (2023). Efektivitas Penggunaan Teknologi AI Dalam Pembelajaran Bahasa Inggris. *Sinar Dunia: Jurnal Riset Sosial Humaniora Dan Ilmu Pendidikan*, 2(2), 256–266. <https://doi.org/10.58192/sidu.v2i2.844>
- Amaliah, A., Fahmy, A. F. R., & Sari, N. H. M. (2024). *Pemanfaatan Media Pembelajaran Berbasis AI di Sekolah*. PT. Nasya Expanding Management.
- Annur, S. (2018). *Metodologi Penelitian Pendidikan*. Noerfikri.

- Brutu, D., Annur, S., & Ibrahim. (2023). Integrasi Nilai Filsafat Pendidikan Dalam Kurikulum Merdeka Pada Lembaga Pendidikan. *Jambura Journal of Educational Management*, 4(2 September 2023), 442–453.
- García-López, I. M., & Trujillo-Liñán, L. (2025). Ethical and regulatory challenges of Generative AI in education: a systematic review. *Frontiers in Education*, 10(June), 1–13. <https://doi.org/10.3389/feduc.2025.1565938>
- Hasni, Batusalu, E., & Kambira, J. (2023). Meningkatkan Kualitas Pembelajaran dengan AI sebagai Asisten Pembelajaran. *Seminar Nasional Teknologi Pendidikan UKI Toraja*, 84–96.
- Ibrahim, Nabila, T., Rahmaliya, N., & Setyaningsi, K. (2023). Pelaksanaan Pembinaan Disiplin Peserta Didik Dalam Proses Pembelajaran. *Sinar Dunia: Jurnal Riset Sosial Humaniora Dan Ilmu Pendidikan*, 2(3).
- Ibrahim, Prasetyo, A., Niswah, C., & Zulkipli. (2022). Sarana dan Prasarana Pendidikan di Madrasah Ibtidaiyah. *Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora*, 2(3), 170–181. <https://doi.org/10.55606/khatulistiwa.v2i3.578>
- Lee, C. C., & Low, M. Y. H. (2024). Using genAI in Education: The Case for Critical Thinking. *Frontiers*, (November). <https://doi.org/10.3389/frai.2024.1452131>
- Miao, F., & Cukurova, M. (2024). *AI Competency Framework for Teachers*. UNESCO. <https://www.unesco.org/en/articles/ai-competency-framework-teachers>
- Moleong, L. J. (2019). *Metodologi Penelitian Kualitatif*. Remaja Rosdakarya.
- Rofiq, M. A. (2022). *Internalisasi Nilai-Nilai Pendidikan Agama Islam Dalam Menumbuhkan Karakter Peduli Lingkungan Hidup ((Studi Kasus di MTs Negeri 2 Malang)* (Vol. 64). UIN Maulana Malik Ibrahim Malang.
- Saat, S., & Mania, S. (2019). *Pengantar Metodologi Penelitian*. Pusaka Almailda.
- Siahaan, M., Jasa, C. H., Anderson, K., & Valentino, M. (2020). Penerapan Artificial Intelligence (AI) Terhadap Seorang Penyandang Disabilitas Tunanetra. *Information System and Technology*, 01(02), 186–193.
- Sugiyono. (2021). *Metodologi Penelitian Kualitatif*. Alfabeta.
- Sugiyono. (2022). *Metode Penelitian Kualitatif*. Alfabeta.
- UNESCO. (2021). *Recommendation on the ethics of artificial intelligence*. <https://www.unesco.org/en/artificial-intelligence/recommendation-ethics>
- UNESCO. (2023). *UNESCO's guidance on generative AI in education and research*. <https://www.unesco.org/en/articles/guidance-generative-ai-education-and-research>
- UNESCO. (2024). *AI competency framework for students*. <https://www.unesco.org/en/articles/ai-competency-framework-students>
- Wahyudinarti, E., Andini Rachmatika, P., & Nurul Ain, R. (2024). Meningkatkan Efektivitas Pembelajaran Mahasiswa Dengan Ai. *JATI (Jurnal Mahasiswa Teknik Informatika)*, 9(1), 488–491. <https://doi.org/10.36040/jati.v9i1.12279>