

Artificial Intelligence in Self-Regulated Learning of Islamic Religious Education: Opportunities and Challenges for Teachers

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ABSTRACT

The development of Artificial Intelligence (AI) has opened up both new opportunities and challenges in Islamic Religious Education (PAI), particularly as a medium for self-regulated learning. This study aims to: (1) describe the concept of utilizing AI as a medium for self-regulated learning in PAI; (2) identify strategic opportunities for PAI teachers; and (3) analyze the challenges faced by PAI teachers along with alternative solutions. This research employs a library research method with a qualitative-descriptive approach. Data sources consist of nationally and internationally accredited journal articles published between 2020 and 2025 that discuss AI in PAI learning. Data collection techniques utilized documentation through searches of academic databases such as Google Scholar, DOAJ, Garuda, and the Sinta portal. Data analysis was conducted using content analysis with a thematic approach based on the model by Miles, Huberman, and Saldaña. The findings reveal three main results. First, the concept of utilizing AI as a medium for self-regulated learning in PAI encompasses three dimensions: accessibility (24/7 learning anytime, anywhere), personalization (materials tailored to individual student needs), and interactivity (direct and adaptive feedback). Second, strategic opportunities for PAI teachers include increased time efficiency, enrichment of learning resources, personalization of learning, increased student motivation, and professional competency development. Third, the main challenges faced by PAI teachers include limited teacher digital literacy, concerns over student misuse of AI, limited infrastructure and the digital divide, as well as ethical and moral issues such as the risk of inaccurate information, AI bias, and reduced direct teacher-student interaction. This study concludes that AI should be positioned as a "teacher's partner" that assists with cognitive and repetitive tasks, not as a replacement for teachers. Consequently, a transformation of the PAI teacher's role into that of an adaptive facilitator, material validator, and moral guide in the digital era is necessary.

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1. Introduction

The development of digital technology has entered a new era, often referred to as Society 5.0, where technology is no longer merely a tool but has become integrated into various aspects of human life, including education (Fukuyama, 2018). One of the most prominent technological innovations is Artificial Intelligence (AI). This artificial intelligence has shifted the learning paradigm from conventional teacher-centered systems toward more flexible, adaptive, and student-centered systems (Holmes, Bialik, & Fadel, 2019; Misbah et al., 2025). In this context, the idea of utilizing AI as a medium for self-regulated learning has emerged, particularly for students in Islamic Religious Education (PAI) (Zimmerman, 2002).

Islamic Religious Education possesses unique characteristics, as it emphasizes not only cognitive aspects but also affective and psychomotor dimensions (Abdullah, 2018). This presents both challenges and opportunities (Ds et al., 2026). On one hand, AI can provide interactive materials, simulations, and instant feedback that help students learn independently outside school hours (Azevedo & Gašević, 2019). On the other hand, PAI teachers are still expected to serve as central figures in fostering moral character and spiritual values—something difficult for machines to replace (Selwyn, 2019). Therefore, it is crucial to analyze in depth how PAI teachers respond to this phenomenon (Auwalayah, Syarif, & Rohmad, 2025).

Research by Auwalayah et al. (2025) indicates that the use of AI in PAI learning brings significant changes for both teachers and students, particularly in accelerating the creation of teaching materials and supporting independent learning (Auwalayah et al., 2025). However, AI implementation does not come without challenges. As stated by Fauzi et al. (2025), the most significant challenges include the limited digital literacy of PAI teachers, uneven infrastructure, and ethical issues such as the potential misuse of data (Fauzi, Zahro, Bashith, & Hakim, 2025). Furthermore, Muhtaram et al. (2025) offer solutions by identifying four aspects of teacher digital competency that can be enhanced through AI utilization: digital literacy, learning content development, digital classroom management, and technology-based learning assessment.

Research by Ramdhani and Hakiman (2025) reinforces findings on the effectiveness of AI in self-regulated learning, discovering that the learning autonomy of PAI students falls into the high category (mean 3.66 on a scale of 4.00), with the highest indicator being the ability to access learning materials independently (mean 4.07); however, their digital literacy level remains moderate (mean 3.56) (Ramdhani & Hakiman, 2025). Sormin, Tobroni, & Faridi (2025) found that AI-based *aqidah* (creed) learning conducted by PAI teachers increased students' interest in studying creed materials, indicating a tendency for students to be more interested in learning through an artificial intelligence approach.

Misbah et al. (2025) found that AI-era learning has great potential to improve the quality of education in a more personalized and efficient manner; however, challenges such as inequality in technology access, limited teacher training, and ethical issues related to personal data must be addressed. From an epistemological perspective, Ds et al. (2026) emphasize that the main challenge in the AI era is not the technology itself, but students' limited capacity to critically verify and contextualize digital religious content. This is reinforced by Floridi and Cowls (2019), who highlight the importance of ethical principles such as transparency, accountability, and fairness in the implementation of AI in the education sector.

Zawacki-Richter, Marín, Bond, and Gouverneur (2019), in their systematic review, found that although AI has great potential to support the teaching-learning process, most research still focuses on technological, pedagogical, and human aspects. Grant and Booth (2009) also emphasized the importance of a systematic approach to reviewing literature to identify existing research gaps.

Although previous studies have discussed various aspects of AI in PAI learning, no research has specifically integrated the aspects of opportunities, challenges, and solutions in the context of self-regulated learning managed by PAI teachers as primary facilitators. The novelty of this study lies in its effort to construct an integrative mapping that identifies opportunities and challenges from the perspective of PAI teachers while offering an adaptive teacher role model amidst the current wave of digitalization. Therefore, this study aims to: (1) describe the concept of utilizing AI as a medium for self-regulated learning in PAI; (2) identify strategic opportunities for PAI teachers; and (3) analyze the challenges faced by PAI teachers along with alternative solutions.

2. Method

This research employs a library research method with a qualitative-descriptive approach (Creswell, 2014). Library research was chosen because the main focus of the study is to examine, analyze, and synthesize various relevant scholarly literature regarding the use of AI as a medium for self-regulated learning, as well as the opportunities and challenges faced by PAI teachers (Grant & Booth, 2009). The qualitative-descriptive approach was selected because this study aims to deeply understand the phenomenon under investigation, not to test hypotheses or calculate quantitative relationships between variables (Miles, Huberman, & Saldaña, 2014).

Data sources for this study are journal articles published within the last five years (2020-2025) that discuss AI in PAI learning (Zawacki-Richter et al., 2019). The selection of these references was based on the following criteria: (1) articles published between 2020-2025; (2) indexed in accredited national databases (Sinta) or international ones (Scopus, Web of Science); (3) specifically discussing AI in PAI learning, self-regulated learning, PAI teacher competencies, or the opportunities and challenges of AI in Islamic education (Holmes, Bialik, & Fadel, 2019). Additionally, this study also uses secondary data from academic books, conference proceedings, and other relevant research findings (Abdullah, 2018; Selwyn, 2019).

Data collection techniques employed the documentation method through three systematic steps (Creswell, 2014). First, literature searching was conducted through academic databases such as Google Scholar, DOAJ (Directory of Open Access Journals), Garuda (Garba Rujukan Digital), and the Sinta journal portal using keywords: "Artificial Intelligence" and "Pendidikan Agama Islam", "AI" and "pembelajaran mandiri" and "PAI", "ChatGPT" and "guru PAI", as well as "kecerdasan buatan" and "peluang dan tantangan" and "guru agama" (Zawacki-Richter et al., 2019). Second, selection and screening were carried out based on predetermined inclusion criteria (Grant & Booth, 2009). Third, data recording was performed using a bibliographic record format that includes author names, year of publication, title, journal name, volume/number, DOI, and key findings (Miles et al., 2014).

Data analysis employed content analysis with a thematic analysis approach, referring to the model by Miles, Huberman, and Saldaña (2014), which consists of three components: data condensation (through in-depth reading, coding, and categorizing data into main

themes: opportunities, challenges, teacher roles); data display (in the form of descriptive narratives and thematic matrices); and conclusion drawing/verification (through synthesis of findings from various sources) (Miles et al., 2014). To ensure data validity, source triangulation was used by comparing findings from at least three journals for each theme, confirming with secondary data, and conducting cross-referencing from the bibliographies of each primary article (Fauzi, Zahro, Bashith, & Hakim, 2025). This triangulation approach aligns with Creswell's (2014) recommendations for enhancing the credibility of qualitative research.

This study was conducted over three months (January-March 2026). The researcher was directly involved in the process of literature searching, collection, and analysis (Miles et al., 2014). Validity checking of research findings was conducted through peer debriefing to ensure no interpretive bias (Creswell, 2014). Additionally, member checking was performed by involving educational practitioners to verify the findings (Lincoln & Guba, 1985, as cited in Creswell, 2014)

3. Finding and Discussion

Finding

The results of this library research are presented based on three research problems that had been established: the concept of utilizing AI as a medium for self-regulated learning in PAI, opportunities for PAI teachers, and challenges faced by PAI teachers.

a. The Concept of Utilizing AI as a Medium for Self-Regulated Learning in PAI

Based on an analysis of 25 journal articles, it was found that the utilization of AI as a medium for self-regulated learning in the PAI context encompasses three main dimensions: accessibility, personalization, and interactivity. The dimensions of AI utilization as a self-regulated learning medium are presented in Figure 1 below.

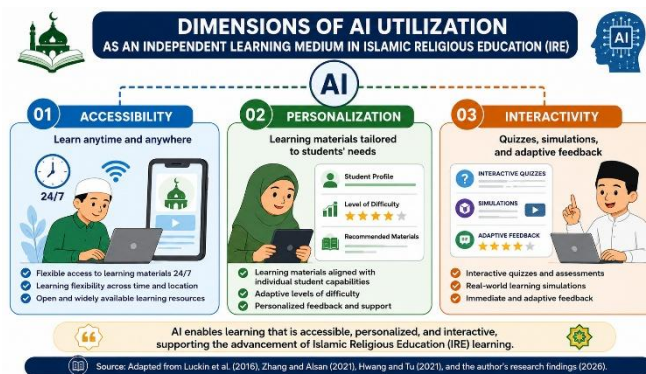


Figure 1. Dimensions of AI Utilization as a Self-Regulated Learning Medium in PAI

The first dimension is accessibility, namely AI's ability to provide 24-hour access to learning materials so that students can learn anytime and anywhere (Luckin, Holmes, Griffiths, & Forcier, 2016). Auwalayah et al. (2025) explain that AI accelerates the creation of teaching materials and expands references, as well as supporting students' independent learning.

The second dimension is personalization, namely AI's ability to adjust materials, difficulty levels, and presentation styles to individual student needs (Zhang & Aslan, 2021). Ramdhani and Hakim (2025) found that the level of learning autonomy among PAI students is in the high category (mean = 3.66), especially in the ability to access

learning materials independently (mean = 4.07) and utilize digital resources effectively (mean = 4.02).

The third dimension is interactivity, namely AI's ability to provide simulations, interactive quizzes, and adaptive feedback that increase student engagement (Hwang & Tu, 2021). Sormin, Tobroni, & Faridi (2025) showed that interactive AI-based *aqidah* learning significantly increases students' learning interest compared to conventional methods. To clarify the analysis results, Table 1 presents a synthesis of the concept of AI utilization in PAI self-regulated learning.

Table 1. Synthesis of the Concept of AI Utilization as a Self-Regulated Learning Medium in PAI

Dimension	Description	Research Findings
Accessibility	AI provides anytime, anywhere access to learning	Accelerates material provision and expands learning resources
Personalization	Materials are tailored to individual student needs and abilities	PAI student learning autonomy is in the high category
Interactivity	AI provides quizzes, simulations, and adaptive feedback	Increases student interest in learning creed (<i>aqidah</i>) materials

Source: Synthesis from Luckin et al. (2016); Zhang and Aslan (2021); Hwang and Tu (2021); Auwalayah et al. (2025); Ramdhani and Hakiman (2025); Sormin, Tobroni, & Faridi (2025)

b. Opportunities for AI Utilization for PAI Teachers

The analysis identified five main opportunities that PAI teachers can optimize. The first opportunity is increased teacher time efficiency in preparing learning materials. Auwalayah et al. (2025) reported that AI accelerates the creation of teaching materials and helps vary assignments and assessments to be more interactive. The second opportunity is the variation and enrichment of learning resources. Fauzi et al. (2025) explain that AI has the potential to increase efficiency, objectivity, and personalization in the PAI learning assessment process through automated grading and learning data analysis. The third opportunity is learning personalization. Ramdhani and Hakiman (2025) highlight the potential of AI tools such as chatbots, intelligent tutoring systems, and adaptive learning platforms in providing personalized support, instant feedback, and motivation for independent learning. The fourth opportunity is increased student motivation and interest in learning. Sormin, Tobroni, & Faridi (2025) found that AI-based *aqidah* learning increases students' interest in studying creed materials. The fifth opportunity is the development of teacher professional competence through the use of AI in Teacher Working Group (KKG) forums and continuous training. Table 2 below presents the opportunities for AI utilization for PAI teachers more clearly.

Table 2. Opportunities for AI Utilization for PAI Teachers

Opportunity	Form of Implementation
Time efficiency	Preparation of teaching materials and automated assessment
Variation of learning resources	Provision of digital and multimedia references
Learning personalization	Chatbots, adaptive learning, and intelligent tutoring systems

Increased motivation	AI-based interactive learning
Teacher competency development	Technology-based training and learning communities

Source: Synthesis from Auwaliyah et al. (2025); Fauzi et al. (2025); Ramdhani and Hakimian (2025); Sormin, Tobroni, & Faridi (2025)

c. Challenges of AI Utilization for PAI Teachers

Analysis of journal articles revealed that PAI teachers face several significant challenges. The first challenge is the limited digital literacy of PAI teachers. Fauzi et al. (2025) assert that teachers' low understanding of how AI works, uneven technological infrastructure, and issues of ethics and data privacy are the main barriers to adopting this technology. The second challenge is the concern over student misuse of AI, such as over-reliance, copy-paste behavior, and decreased critical thinking skills. Ds et al. (2026) clearly state that the main challenge in the AI era is not the technology itself, but students' limited capacity to critically verify and contextualize digital religious content.

The third challenge is limited infrastructure and the digital divide, including uneven internet access and a lack of supporting devices (Holmes et al., 2019). Holmes and Mavrikis (2019) emphasize that AI systems should not be viewed as replacements for teachers, but as complements that strengthen the humanistic aspects of teaching. The fourth challenge is ethical and moral issues, such as the risk of inaccurate information (hallucination), AI bias, and reduced direct teacher-student interaction, which affect the affective and spiritual aspects. This aligns with the findings of Syamsidar (2026), which state that integrating AI into science and religious education can enhance both scientific literacy and students' moral awareness, yet requires a holistic pedagogical approach. Damayanti and Ridwan (2024) affirm that the role of PAI teachers in the digital era is no longer limited to delivering teaching materials, but also includes roles as facilitators, motivators, and agents of change who contribute to creating an inclusive learning environment responsive to the needs of the times.

Table 3. Challenges of AI Utilization for PAI Teachers

Challenge	Resulting Impact
Low teacher digital literacy	Difficulty operating and integrating AI
Student dependence on AI	Decreased critical thinking skills
Infrastructure gap	Uneven implementation

Source: Fauzi et al. (2025); Ds et al. (2026); Holmes and Mavrikis (2019); Syamsidar (2026).

Thus, overall, the research results indicate that AI has great potential as a medium for self-regulated learning in Islamic Religious Education through increased accessibility, personalization, and interactivity of learning. However, the success of its implementation heavily depends on teacher readiness, infrastructure support, and the strengthening of ethical aspects and digital literacy so that AI utilization remains aligned with the goals of Islamic education, which emphasize the development of students' cognitive, affective, and spiritual aspects.

Discussion

The results show that the opportunities and challenges of utilizing AI in PAI learning are not standalone but are closely interrelated. These findings confirm what was identified by Fauzi et al. (2025): that the greatest opportunities of AI are also simultaneously the source of the greatest challenges.

One of the most important findings from this literature synthesis is that the role of PAI teachers does not become obsolete or replaced by AI; rather, it shifts and becomes more strategic. Auwalayah et al. (2025) affirm that the teacher's role remains crucial as a validator and gatekeeper of material, especially to maintain the authenticity of knowledge transmission in accordance with Islamic traditions. Muhtaram et al. (2025) add that collaboration between teachers and AI enables continuous improvement of digital competencies, although it faces challenges such as the digital divide, resistance to change, and ethical considerations in the context of Islamic education. This shift in roles aligns with the demands of learning in the Society 5.0 era, where teachers are required to be adaptive facilitators in the face of changing times.

The finding regarding teacher digital literacy as the most fundamental challenge is also noteworthy. Ds et al. (2026) philosophically emphasize that the main challenge in the AI era is not the technology itself, but students' capacity to critically verify and contextualize digital religious content. Islamic epistemological principles offer a normative basis for developing religious critical reasoning, making the integration of digital literacy with Islamic epistemology in curricula and pedagogy crucial for forming learners who are intellectually mature and epistemically resilient. This has implications for the need to strengthen religious critical literacy within the PAI curriculum.

The findings of this study have several important implications. First, there is a need for continuous and contextual digital literacy training programs for PAI teachers (Fauzi et al., 2025). Second, schools and education offices need to provide adequate and equitable infrastructure to prevent the widening of the digital divide (Auwalayah et al., 2025). Third, PAI learning models that systematically integrate AI need to be developed, where AI is used to help students access information, while teachers use the available time for group discussions and personal mentoring. Fourth, there needs to be recognition and appreciation for teachers who innovate with AI to motivate other teachers (Ramdhani & Hakiman, 2025).

A limitation of this study is that it only analyzed journal articles within the last five years using a library research approach; it does not depict direct implementation in the field. Further research is recommended to conduct qualitative field studies that explore in depth the experiences of PAI teachers in integrating AI, quantitative research measuring the effectiveness of AI-assisted PAI learning models, and development research on AI literacy training models for PAI teachers (Ds et al., 2026).

4. Conclusion

Based on the research findings and discussion, three main conclusions can be drawn. First, the concept of utilizing AI as a medium for self-regulated learning in PAI encompasses three dimensions: accessibility (24/7 learning anywhere), personalization (materials tailored to individual student needs), and interactivity (direct and adaptive feedback). AI should be positioned as a "teacher's partner" that assists with cognitive and repetitive tasks, not as a teacher replacement, with the teacher retaining the role of validator and moral guide.

Second, the opportunities that PAI teachers can optimize include: (1) time efficiency in preparing learning materials and assessments; (2) variation and enrichment of learning resources from multiple perspectives; (3) personalization of learning according to student pace and learning styles; (4) increased student motivation and interest in PAI materials; and

(5) development of teacher professional competence through the use of AI tools in Teacher Working Group forums and continuous training.

Third, the challenges faced by PAI teachers include: (1) limited teacher digital literacy that hinders the adoption and optimization of AI; (2) concerns about student misuse of AI (risks of over-reliance, copy-paste, and decreased critical thinking skills); (3) limited infrastructure and the digital divide that create inequitable access; and (4) ethical and moral challenges such as the risk of inaccurate information (hallucination), AI bias, and reduced direct teacher-student interaction impacting the affective and spiritual aspects of PAI learning.

Recommendations from this study are: (1) the need for continuous digital literacy training programs for PAI teachers covering technical, pedagogical, and ethical aspects; (2) provision of equitable infrastructure by schools and education offices including internet access and adequate devices; (3) development of PAI learning models that systematically integrate AI while maintaining a balance between technological efficiency and character development; (4) provision of recognition and appreciation for teachers who innovate with AI; and (5) formulation of ethical policies for AI use in Islamic education settings. Further research is recommended to conduct qualitative field studies, training model development research, and cross-regional comparative studies.

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