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Integration of Artificial Intelligence in PAI Material Development: Analysis of Learning Effectiveness and Interaction

Muhammad[1]
Wahab[2]

Muhamtanhily@gmail.com
Abdulwahabassambasi@gmail.com

Abstract: *The research aims to examine the literature on applying artificial intelligence (AI) in Islamic Religious Education (PAI) materials to evaluate its effectiveness in enhancing interaction and learning quality. This literature review explores how AI can facilitate interactive and adaptive learning experiences tailored to students' needs while strengthening the overall effectiveness of PAI instruction. This study employs a qualitative approach through a literature review, analyzing 30 sources from the past decade (2014–2024) related to educational technology, AI implementation, and PAI teaching materials. Previous research indicates that AI in PAI materials can personalize learning, provide real-time feedback, and improve student engagement with the content. However, AI may also reduce interpersonal interaction in religious discussions. Therefore, integrating AI with discussion-based learning is recommended for optimal outcomes. The development of AI-based PAI materials has the potential to enhance learning effectiveness and foster more dynamic interactions in the digital era. Academically, the research emphasizes the significance of hybrid learning that combines AI with active learning methods and underscores the need to balance technology with teacher-student interaction in education.*

Keywords: *Integration of Artificial Intelligence, Development of Pie Materials, Learning Effectiveness, Learning Interaction, Educational Technology*

Abstrak: *Penelitian ini bertujuan untuk mengkaji literatur tentang penerapan kecerdasan buatan (AI) dalam materi Pendidikan Agama Islam (PAI) untuk mengevaluasi efektivitasnya dalam meningkatkan interaksi dan kualitas pembelajaran. Kajian literatur ini mengeksplorasi bagaimana AI dapat memfasilitasi pengalaman belajar yang interaktif dan adaptif yang disesuaikan dengan kebutuhan siswa sekaligus memperkuat efektivitas pengajaran PAI secara keseluruhan. Penelitian ini menggunakan pendekatan kualitatif melalui tinjauan literatur, menganalisis 30 sumber dari satu dekade terakhir (2014-2024) yang terkait dengan teknologi pendidikan, implementasi AI, dan bahan ajar PAI. Penelitian sebelumnya menunjukkan bahwa AI dalam materi PAI dapat mempersonalisasi pembelajaran, memberikan umpan balik secara real-time, dan meningkatkan keterlibatan siswa dengan konten. Namun, AI juga dapat mengurangi interaksi interpersonal dalam diskusi keagamaan. Oleh karena itu, mengintegrasikan AI dengan pembelajaran berbasis diskusi direkomendasikan untuk mendapatkan hasil yang optimal. Pengembangan materi PAI berbasis AI*

[1] Institut Agama Islam Negeri Pontianak
[2] Institut Agama Islam Negeri Pontianak

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memiliki potensi untuk meningkatkan efektivitas pembelajaran dan mendorong interaksi yang lebih dinamis di era digital. Secara akademis, penelitian ini menekankan pentingnya pembelajaran hibrida yang menggabungkan AI dengan metode pembelajaran aktif dan menggarisbawahi perlunya menyeimbangkan teknologi dengan interaksi guru-siswa dalam pendidikan.

***Kata Kunci**: Integrasi Kecerdasan Buatan, Pengembangan Materi PAI, Efektivitas Pembelajaran, Interaksi Pembelajaran, Teknologi Pendidikan*

Introduction

Islamic Religious Education (PAI) faces major challenges in the digital era, where traditional methods struggle to engage modern students. Although AI has transformed various fields of education, its application in PAI remains largely unexplored (Suarifqi Diantama, 2023). Previous studies have highlighted the potential of AI to enhance student engagement and learning motivation. Technological advancements have transformed various aspects of life in the digital era, including education. Millennials and Generation Z have unique characteristics, such as quick access to information, reliance on technology in learning, and a preference for dynamic, visual, and engaging interactions (Nata, 2018). PAI faces the challenge of adapting teaching methods to the characteristics of the digital generation but also has the opportunity to leverage technology.

The development of technology-based PAI is a necessity in the digital era. This involves digital tools and pedagogical approaches aligned with students' learning styles. Interactive media such as videos, animations, and applications can enhance students' interest in and understanding Islamic teachings (Gupta, 2022).

The digital generation requires relevant and contextual content. With a critical and skeptical mindset, they encounter various sources of information, both aligned with and contrary to religious values. Technology-based PAI can guide filtering information while teaching critical and analytical thinking skills when dealing with diverse sources (Astuti, Sarjono, and Hariyadi, 2021). Technology enhances student interaction and collaboration through online platforms, enabling discussions and projects based on religious values. PAI learning extends beyond the classroom, involving parents, communities, and other stakeholders in strengthening religious values and shaping students' character (Muhdi *et al.*, 2024).

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Expanding access to quality education requires inclusive technology-based PAI. Learning materials must be accessible to all students, including those with limited technology access. Therefore, alternative methods, such as printed and offline materials, should be provided to ensure equal learning opportunities (Laufer *et al.*, 2021).

Previous research by Suarifqi Diantama (2023) Bestari University, Serang. This research highlights the rapid advancement of AI, particularly the use of ChatGPT in 4.0 technology-based education. ChatGPT benefits students by increasing engagement, boosting learning motivation, enhancing 21st-century skills, and reducing anxiety. For teachers, AI is crucial in improving teaching effectiveness, supporting professional development, and assisting with assessment and learning management. Integrating AI in education offers a more interactive and efficient learning experience, benefiting students and educators. (Suarifqi Diantama, 2023).

Research conducted by Szrinda (2023) Al-Ittifaqiah Indralaya Islamic Religious Institute examines the use of AI in enhancing student engagement in PAI self-learning through AI-based applications. The research focuses on a curriculum tailored to individual learning preferences, creating a more personalized and flexible learning experience. The results show that AI can provide engaging, interactive learning materials adapted to students' needs and learning pace (Sarinda *et al.*, 2023).

Research conducted by Rizma Ilfi and Sofwan Manaf (2022) at Darunnajah University, Jakarta, discusses the application of AI in education, particularly in character education. AI has rapidly developed and influenced various aspects of life, including the formation of moral and ethical values in learning. Integrating AI in education raises ethical challenges such as integrity, digital ethics, and responsible use of technology (Rizma Ilfi, 2022).

This study highlights the development of AI-based skills in PAI learning by integrating technology into the curriculum and student evaluation. The main difference from previous research lies in the effectiveness and interaction between students and teachers in the learning process. The development of technology-based PAI design is expected to introduce innovative teaching strategies that not only enhance religious understanding but also shape a generation that is competitive in the digital era. This research focuses on the development of AI-based PAI materials, the

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benefits of AI in enhancing learning interactions, and the effectiveness of its application in the teaching and learning process. Thus, this study explores how AI can be optimally utilized in PAI education to improve the quality of learning and student engagement.

Research Methods

This study employs content analysis with a qualitative literature study approach to examine the application of AI in Islamic Religious Education (PAI). Data from 30 literature sources from 2014 to 2024 focused on educational technology, AI implementation, and PAI teaching materials. This literature study collects, evaluates, and synthesizes sources from journal databases such as Scopus, IEEE, and Google Scholar. The research critically analyzes theories, concepts, and previous studies through this approach, providing a strong theoretical foundation and a comprehensive perspective on the topic under review. (Seers, 2012).

Results and Discussion

Development of AI-Based PAI Materials

The development of artificial intelligence (AI)--based Islamic Religious Education (PAI) materials is a creative effort in designing, compiling, and presenting learning using advanced technology. Its goal is to enhance the quality of education, optimize student interaction with the material, and address the challenges of modern education. This technology significantly changes religious teaching methods, not only in content delivery but also in the expected outcomes. AI is more than just a technical tool; it creates a more interactive, effective, and personalized learning experience tailored to each student's needs (Pambudi & Makhrus, 2022).

Various approaches that can be implemented in the development of Islamic Religious Education (PAI) materials based on artificial intelligence (AI) have several aspects, including:

1. Use of Adaptive Learning System

Adaptive learning systems are an innovative approach in education that utilizes artificial intelligence (AI) algorithms to tailor teaching content to each student's unique characteristics, including their academic abilities and learning styles (Shaun, De Baker, and Inventado, 2014).

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Adaptive learning systems can identify patterns in student learning performance using sophisticated data analysis techniques. This allows the system to understand which areas are students' strengths and which areas are challenging for them (Luckin & Holmes, 2016).

Adaptive learning systems help students struggling with religious concepts by providing targeted support, such as explainer videos, supplemental readings, and interactive exercises, ensuring a more effective learning process (Zawacki-Richter *et al.*, 2019).

Adaptive learning systems act as responsive learning partners, supporting students' academic growth by tailoring learning to their needs. This approach enhances engagement, making learning more effective and enjoyable and fostering deeper understanding (Ranjha *et al.*, 2024).

2. Implementation of Educational Chatbots

Adaptive learning systems act as responsive learning partners, supporting students' academic growth by tailoring learning to their needs. This approach enhances engagement, making learning more effective and enjoyable and fostering deeper understanding (Abdelwahab *et al.*, 2004). One of the key advantages of using chatbots in an educational context is their ability to provide instant answers to questions posed by students. In the learning process, students often have questions that cover various aspects, from basic concepts to more complex questions (Doering, Veletsianos, and Yerasimou, 2008).

The dialogical interaction offered by chatbots is very helpful in reducing the distance between students and teaching materials. Through natural conversations, students can more easily explore PAI materials while interacting with important concepts such as faith, worship, and Islamic ethics (Shaun, De Baker, and Inventado, 2014). Not only that but chatbots can also be programmed to provide personalized feedback and learning recommendations according to student progress (Khalid *et al.*, 2022)

3. Presentation of Interactive Content via Mobile Application

The development of a mobile application that presents Islamic Religious Education (PAI) materials in an interactive format has great potential to enrich the student learning experience in a more interesting and enjoyable way (Kulbi, 2019).

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According to research by Alqahtani and Rajkhan (2020), a mobile-based learning app can increase student engagement by providing quick and easy access to a wide range of subject matter, according to Mayer (2020), can accelerate student understanding and make the learning process more interesting than traditional teaching methods that tend to be monotonous.

4. Data Analysis for Feedback and Material Development

Artificial Intelligence (AI) has an incredible ability to collect, process, and analyze data related to student behavior and learning patterns, which can provide many benefits in the educational process (Romero & Ventura, 2010). According to Luckin & Holmes (2016), AI can record students' interactions with the learning platform, including how long they spend understanding a topic, their difficulty level, and the most common mistakes.

A study conducted by Chen et al. (2020) **found that** AI-based data analysis helps educators identify problems early by detecting signs of declining student performance. This allows teachers to provide timely interventions, such as additional guidance or personalized teaching, to support student success.

5. Implementation of Interactive Simulation and Role-Playing

With the support of Artificial Intelligence (AI) technology, the presentation of Islamic Religious Education (PAI) materials can be improved through more interactive and immersive approaches, such as simulation or role-playing (Sponsor *et al.*, 2021). According to research by van Esch et al. (2020), AI-driven simulations help students develop practical skills by creating realistic scenarios aligned with Islamic teachings. These simulations enhance learning by teaching hajj rituals, ethical decision-making, and Islamic economic principles, making education more applicable to real life.

AI-based simulations enhance students' deep understanding by requiring them to apply learned concepts in real scenarios. This approach strengthens cognitive comprehension in PAI and helps internalize Islamic values through practical experience. Long (2023) notes that the simulation allows students to reflect on their decisions and understand their long-term impact.

Simulation and role-playing in AI-based PAI can help students better internalize Islamic values. A study by Chernikova et al. (2020) explains that the simulation allows students to practice moral and ethical values in a safe and controlled environment

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before applying them in real life. The use of AI in PAI learning can be explained through the theory of Digital Cognitivism and Social Constructivism, which supports adaptive and interactive learning. In Islamic pedagogy, AI can be applied through the Tarbiyah Islamiyah and Ta'lim wa Ta'dib approach to shaping religious character and understanding. Challenges of AI Implementation in PAI Learning

Table 1 Challenges of AI Implementation in Islamic Religious Education (PAI)

Aspects	**AI-Based Learning**	**Conventional Methods**
Learning Customization	Adaptive according to student needs, can be personalized	General, less flexible
Interactivity	Interactive with features like chatbots, videos, and simulations	More face-to-face lectures and discussions
Accessibility	It can be accessed at any time through an online application or platform	Limited to school hours and in-person interaction
Time Efficiency	Allows self-paced learning at your own pace	Depends on the teacher's teaching speed
The Role of Teachers	Teachers as facilitators and supervisors of the use of technology	Teachers as the main source of information
Challenge	Technology limitations in some schools, AI ethics issues	Less attractive to the digital generation, limited time

Implementing AI in Islamic Religious Education (PAI) faces challenges such as limited infrastructure, lack of teacher readiness, ethical concerns, and potential over-reliance on technology. Additionally, community skepticism remains, as some fear AI may replace traditional student-teacher interactions. Ensuring AI aligns with Sharia values and enhances human engagement, rather than replaces, is crucial for its effective adoption.

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Benefits of Applying AI in Improving PAI Learning Interaction

One of the most significant benefits of applying artificial intelligence (AI) to Islamic Religious Education (PAI) learning is the increase in interaction between students, teachers, and teaching materials (Chen, Chen, and Lin, 2020).

1. Personalized Interactions

The application of AI in PAI learning allows for more personalized learning for students. AI systems can analyze students' individual learning styles, abilities, and needs and then adjust the method of delivering material according to these characteristics (Chen, Chen, and Lin, 2020). As a support (Saaida, 2023), In his book AI-Driven Transformations in Higher Education: Opportunities and Challenges, explains that AI enables "adaptive learning," where AI systems can adapt content based on student learning progress in real-time.

2. Automated Question Submission and Assessment

AI-based learning systems can ask automated questions and assess student responses in real-time. For example, in a lesson on Islamic history, an AI system can present a quiz that provides multiple-choice questions and more in-depth analysis questions, which are then assessed by AI algorithms (Das *et al.*, 2021). According to Woolf (2010), Deep, Building Intelligent Interactive Tutors, an AI system integrated into education, allows for continuous feedback to students.

3. Enhance Interactive Discussions

One key aspect of PAI learning is deep discussions on Islamic values and their application in daily life (Hafiz & Mu'ti, 2024). AI-based chatbots can serve as interactive tools to facilitate discussions by asking questions, assessing responses, and providing feedback (Sholeh, Rushdiyah, and Abu Bakar, 2024).

4. AI Chatbot as a Learning Media Outside the Classroom

AI chatbots can serve as personal learning assistants, allowing students to learn and ask questions anytime, even outside class hours, helping them overcome difficulties in understanding PAI material (Lutfi, 2024). In research by Aeni et al. (2024) entitled "Revolutionized Teaching by Incorporating Artificial Intelligence Chatbot for Higher Education Ecosystem," AI chatbots are referred to as effective tools for enhancing student engagement outside the classroom by providing instant responses and supporting flexible and independent learning.

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5. Development of Critical and Reflective Thinking Skills

AI can also stimulate students to develop critical and reflective thinking skills. In learning PAI, critical thinking is necessary to assess and apply Islamic teachings in the context of modern life that continues to develop (Muhid, 2021).

For example, AI systems can simulate debates regarding contemporary issues in Islam, such as the role of technology in Muslim life or how the principles of Islamic economics can be applied to modern business.

The Effectiveness of PAI Learning with AI

The effectiveness of Islamic Religious Education (PAI) learning with the support of AI can be seen from various perspectives. AI provides a more interactive, personalized, and contextual approach to PAI teaching, which improves students' understanding of the subject matter.

Based on a literature review, the application of AI in education can increase learning effectiveness in several ways:

1. Increased Motivation

The use of AI in learning enhances student motivation through more visual, dynamic, and interactive materials. Videos, animations, and educational games make learning more engaging, while active interaction and instant feedback accelerate comprehension. Gamification, such as challenges and reward systems, encourages students to learn more actively.

2. Continuous Learning

AI allows students to learn beyond classroom boundaries in a globally connected era. With this technology, they can access educational materials anytime and anywhere without being restricted by specific times or places. (Brusilovsky and Millán, 2007). An AI-based platform enables students to explore vast knowledge with a personalized and dynamic learning experience (Chen, Chen, and Lin, 2020).

Thus, continuous learning powered by AI not only makes education more accessible but also enriches the overall learning experience. This is an important step towards a more inclusive, adaptive, and sustainable future of education.

3. More Accurate Evaluation

AI can identify students' mistakes and weaknesses in more detail, enabling deeper and more focused evaluations. Through precise data analysis, AI detects

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learning patterns that may be overlooked by human observation, providing a more comprehensive picture of students' academic progress (Baker, 2019). Thus, AI technology in education improves the student learning experience and enriches teachers' role in creating more personalized, adaptive, and effective learning.

Conclusion

This study highlights that AI integration in PAI enhances learning effectiveness, personalization, and interaction. AI supports automated feedback, teacher management, and student progress monitoring. Effective implementation requires teacher training, a balanced tech-human approach, and inclusive digital platforms. Further research is needed on AI's long-term impact on ethics, privacy, and character development. AI holds great potential to make religious education more interactive, effective, and relevant in the digital era.

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