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The Use of Artificial Intelligence (AI) in PAI Learning to Develop Students' Critical Thinking Skills

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Abstract: The purpose of this study is to analyze how the use of Artificial Intelligence can contribute to the development of critical thinking skills in Islamic religious education (PAI) lerning. This study uses a qualitative descriptive method with a literature review approach through journal artcles, books, and literary works related to the use of Artificial Intelligence (AI) and critical theory. The results of the study indicate that Artificial Intelligence (AI) plays an important role in creating adaptive, interactive, and analytical learning through featuares such as Natural Language Processing. (NLP), adaptive learning, educational chatbots, and data -driven automated evaluation. This technology enables students to critically analyze religious texts, compare references, and evaluate the quality of information to systematically improve their critical thinking skills. In addition, Artificial Intelligence helps teachers personalize materials, provide quick feedback, and enrich classroom discussions using structured data. This study shows that the use of Artificial Intelligence (AI) is not only a technical tool, but also a useful educational tool to improve the quality of education in the digital era. This is a summary of the reasons for conducting the research, the approaches or methods chosen, important results, and main conclusions.

Keywords: Artificial Intelligence; PAI Learning; Critical Thinking.

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Abstrak: Tujuan penelitian ini adalah untuk menganalisis bagaimana penggunaan Artificial Intelligence dapat berkontribusi pada perkembangan dalam kemampuan berfikir kritis dalam pembelajaran pendidikan agama Islam (PAI). Penelitian ini menggunakan metode deskriptif kualitatif dengan pendekatan studi pustaka melalui artikel jurnal, buku, dan karya sastra yang berkaitan dengan penggunaan Artificial Intelligence (AI) dan teoritis kritis. Hasil penelitian menunjukkan bahwa Artificial Intelligence (AI) memainkan peran penting dalam menciptakan pembelajaran yang adaptif, interaktif, dan analitis melalui fitur-fitur seperti pemrosesan Bahasa Alami (NLP),pembelajran

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adaftif, chatbot pendidikan, dan evaluasi otomatis berbasis data. Teknologi ini memungkinkan siswa untuk melakukan analisis kritis terhadap teks keagamaan, membandingkan refrensi, dan melalui kualitas informasi guna meningkatkan kemampuan berpikir kritis secara sistematis. Selain itu, Artificial Intelligence membantu guru mempersonalisasi materi, memberikan umpan balik yang cepat, dan memperkaya diskusi kelas dengan menggunakan data yang terstruktur. Studi ini menunjukkan bahwa penggunaan Artificila Intelligence bukan hanya alat tejnis, tetapi juga alat pendidikan yang berguna untuk meningkatkan kualitas pendidikan di eradigital adalah ringkasan mengenai alasan penelitian dilakukan, pendekatan atau metode yang dipilih, hasil-hasil penting, dan simpulan utama.

Kata Kunci: Artificial Intelligence; Pembelajaran PAI; Berfikir Kritis.

A. Introduction

Artificial Intelligence (AI) is a technology that is developing rapidly in line with the times and increasingly complex global situations with digital advances. AI also plays an important role in various fields, including education, and even in Islamic religious education (Fuad & Fakhruddin, 2024). AI is a technology that can improve learning effectiveness through methods such as adaptive learning and predictive analysis, which can stimulate students' critical thinking in understanding and learning Islamic teachings in a contextual and logical manner. By definition, AI is a branch of computer science that focuses on developing machine systems to perform certain tasks with intelligence that mimics human intelligence, such as understanding grammar, solving problems, and understanding issues (Muchlis, 2025).

Artificial intelligence (AI) plays an important role in improving the effectiveness of Islamic education. Through the use of AI, Islamic education can become more adaptive and interactive, for example through the presentation of Qur'an and hadith material in the form of digital applications, thereby facilitating the learning process for teachers. In the context of education in general, AI leads to systems capable of creating human behaviors such as learning, thinking, and problem solving (Collins et al., 2021). In addition, in the field of education, AI is capable of identifying learning styles, levels of mastery of material, and students' learning speeds, thus enabling the application of

more personalized learning. Artificial intelligence offers innovative solutions to improve the quality of learning that is more interesting and effective. The use of AI in Islamic religious education not only increases the effectiveness of the teaching and learning process, but also encourages critical thinking skills and a more comprehensive understanding of Islamic teachings through the use of AI (Sodikin, 2024).

The rapid development of digital technology in the 21st century has had a significant impact on various aspects of life, including education (Muchlis, 2025). Digital transformation has driven a paradigm shift in learning that focuses not only on mastering knowledge but also on strengthening students' critical thinking skills. In the context of Islamic Religious Education (PAI) learning, the challenges faced are increasingly complex because students are exposed to a variety of religious information from various sources that are not necessarily valid and whose accuracy cannot be verified. Social phenomena show that many students tend to accept information passively without critically assessing the content, accuracy, and relevance of religious teachings to the realities of life. Therefore, an innovative and adaptive learning approach is needed, one of which is through the use of artificial intelligence (AI) technology that can encourage students to think actively, analytically, and reflectively about the religious values they learn.

Previous studies have shown that the use of artificial intelligence (AI) in education has a positive impact on improving learning effectiveness, especially in exact subjects such as mathematics and science(Muin & Kusmaladewi, 2025). Previous research also shows that the use of AI in adaptive learning can improve student academic achievement and accelerate the process of concept understanding(Al Fadillah & Akbar, 2024). Meanwhile, a number of other studies reveal that AI has great potential in supporting personalized learning and helping to develop higher-order thinking skills, such as metacognitive thinking. However, research on the use of AI in the context of Islamic Religious Education is still limited and generally only emphasizes technical aspects, such as digital Quran recognition applications or religious chatbots(Ummah et al., 2024). These studies have not specifically examined how AI can be used pedagogically to encourage students' critical thinking skills in Islamic Religious

Education (IRE) learning. Therefore, this study aims to fill this gap and offer a new perspective on the integration of technology, particularly AI, in reflective and transformative Islamic Religious Education learning.

The urgency of this research is also based on the fact that Islamic Religious Education (IRE) in schools still tends to be conventional, one-way, and does not fully encourage students to think deeply. In fact, in today's digital age, students are required to be able to critically evaluate information, including religious information that is widely available on the internet and social media. Therefore, this research is important to contribute to innovations in PAI learning that are relevant to the needs of the times. The use of artificial intelligence technology is expected to be one of the strategic solutions in improving the quality of learning that not only emphasizes cognitive aspects (knowledge) but also affective aspects (attitudes) and psychomotor aspects (skills), especially in fostering rational and contextual religious awareness.

This study aims to examine how the use of artificial intelligence (AI) applications in Islamic Religious Education (IRE) learning can contribute to developing students' critical thinking skills. This study focuses on forms of AI applications that are relevant in the context of IRE learning, the role of teachers in the process of integrating this technology, and its impact on students' thinking patterns in understanding and responding to religious material. The research questions examined in this study include: (1) what are the forms of AI utilization in PAI learning; (2) to what extent can AI utilization improve students' critical thinking skills in understanding Islamic values; and (3) what are the challenges faced in integrating AI into PAI learning.

B. Research Method

This study uses a descriptive qualitative approach with a library research method. Library research is an approach that aims to develop a theoretical basis for the issues being studied(Asyiah & Husnaini, 2025). This approach was chosen because the main objective of the study was to thoroughly examine various relevant literature to understand the potential use of artificial intelligence (AI) in Islamic Religious Education (PAI) to develop students' critical thinking skills. In this approach, the study did not

collect field data directly but collected and analyzed data from various written sources that were available and accessible academically. The research procedure includes problem identification, literature data collection, source classification, and systematization of ideas. This approach allows researchers to conduct broad and in-depth conceptual exploration, particularly in answering theoretical questions related to the integration of artificial intelligence technology in Islamic Religious Education learning.

The data sources used in this study are divided into two categories: primary data and secondary data. Primary data is the main source of data derived from previous research, such as scientific journals and recent books that directly discuss the use of artificial intelligence (AI) and critical thinking theory(Mawaddah, Agustina, Amalia, Raharjo, & Amin, 2025). Meanwhile, secondary data is supporting data that was already available, such as popular scientific articles that have been academically verified and student theses discussing the use of AI and critical thinking theory. The unit of analysis in this study consists of scientific works, including educational books, journal articles, and various other literature relevant to the study of critical thinking theory. Through this method, it is hoped that the study can produce a strong conceptual study as a basis for developing AI-based Islamic Education (PAI) learning innovations.

C. Results and Discussion

Forms of Artificial Intelligence Utilization in Islamic Religious Education (PAI)

The utilization of digital technology in Islamic Religious Education (PAI) in today's digital era greatly influences the effectiveness of the learning process. The availability of various digital tools and platforms enables the teaching and learning process to be more interactive and interesting for students(Mubarok, Isro, & Atikoh, 2025). Various technology-based learning platforms make it easier for teachers to deliver material and help students understand the learning process more optimally. One form of artificial intelligence (AI) utilization in PAI learning is the use of adaptive learning platforms that allow teachers to adjust the curriculum to students' abilities, skills, and levels of understanding(Nisa, Ginting, Ananda, & Korespondensi, 2025).

Through data analysis algorithms, AI systems are able to identify the level of difficulty students experience in learning PAI concepts, such as faith, jurisprudence, and morals, and then provide recommendations for further material or reinforcement according to the needs of each student. This learning model allows students to have a more relevant and personalized learning experience. In classroom learning practices, teachers do not only rely on lecture methods, but also utilize AI technology to create interactive learning simulations, automated quizzes, and visual presentations that help students understand concepts more clearly and systematically. The use of this technology provides students with greater opportunities to learn independently, flexibly, and in accordance with their individual needs and learning styles. Thus, the integration of AI in PAI learning can improve the quality of learning while encouraging students to actively engage in the learning process.

One form of artificial intelligence (AI) utilization in Islamic Religious Education learning is the use of Natural Language Processing (NLP). NLP is an AI application that can analyze words, linguistic structures, and even the context of verses from the Qur'an or hadith(Agustina & Marhamah, n.d.). Teachers can use this facility to encourage students to conduct in-depth studies of the meaning of verses, compare various interpretations, and identify the moral principles contained therein. Thus, AI not only functions as a technical tool, but also as a learning medium that helps students analyze and understand the values of Islamic teachings more comprehensively. This technology is very useful, especially for students who still have difficulty understanding Arabic or the context of Islamic law. Through the use of NLP, the learning process becomes more in-depth and text-based, enabling the systematic and targeted development of students' critical thinking skills.

The use of artificial intelligence (AI) in Islamic Religious Education (IRE) learning can also be seen through the use of educational chatbots. This technology has developed rapidly as an AI-based intelligent system that is capable of understanding natural language and providing instant explanations of learning materials(Kunci, 2025). AI-based chatbots can answer students' questions about verses from the Qur'an, hadiths, and contemporary religious phenomena in easy-to-understand language.

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Through this interaction, students can learn independently according to their needs and time without relying entirely on the teacher's explanations, making the learning process more flexible and interesting. In addition, AI is also used to provide automatic feedback on student performance in class. With its rapid analysis capabilities, the AI system can identify errors, provide contextual explanations, and include additional references. These features contribute to shaping students' critical thinking patterns, as students not only receive information that is right or wrong, but also understand the reasons and essence of a conclusion in a more logical and profound way.

Artificial intelligence (AI) is also utilized in the form of data-based learning evaluation applications that are capable of accurately assessing students' skill development. Through the system dashboard, teachers or instructors can observe students' learning styles, their level of understanding of the material, and their ability to argue(Oktavianus, Naibaho, & Rantung, 2023). This data can be used as a basis for improving teaching methods and developing Islamic Education (PAI) materials to better suit the needs of students. In addition, AI also supports the application of case studies that are relevant to students' daily lives, such as digital content analysis and social interactions in real-world contexts. Through these scenarios, students are trained to analyze arguments, identify the consequences of an action, and develop moral solutions that are in line with Islamic teachings. This approach is considered effective in encouraging the development of students' critical thinking skills, as they are required to process information in depth and make decisions rationally and responsibly.

The influence of Artificial Intelligence on improving students' critical thinking skills

Higher-order thinking skills are skills that include critical and creative thinking, analysis, problem solving, and visualization. To build between concepts and material, students need analysis, logical thinking skills, creativity, and criticism to be used in understanding and solving problems(Rahardhian, 2022). Based on the two findings above, critical thinking skills are a process in which individuals analyze an idea to solve problems. In philosophical terms, the concept of critical thinking focuses on critical nature, attitude, and qualities. Critical thinking attitudes are also the focus of

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analysis. The following diagram illustrates the concept of critical thinking according to philosophy.

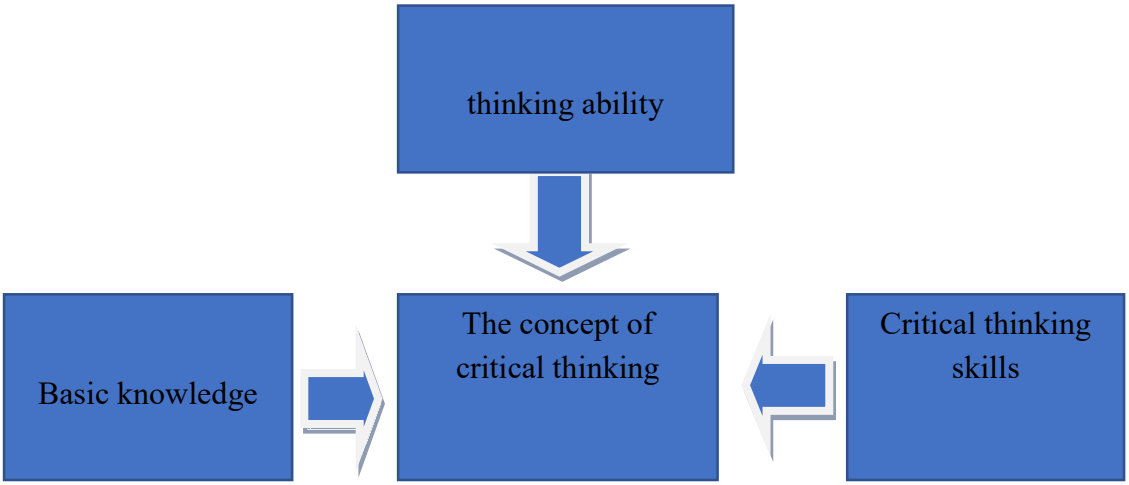

Figure 1.1 Concept of critical thinking

The use of Artificial Intelligence in Islamic religious education (PAI) has a significant impact on students' critical thinking skills. Through automatic analysis, Artificial Intelligence is able to provide various perspectives on a concept so that students are not limited to receiving information in one way(Putri, Andjani, & Rafael, 2023). When students interact with Artificial Intelligence-based applications, they are required to analyze, understand, and compare the information generated by the system with the material provided by the teacher. This process evaluates students' evaluative abilities in determining the accuracy and relevance of information. In addition, Artificial Intelligence facilitates case-based discussions that encourage students to discuss contemporary issues using logical arguments. Thus, Artificial Intelligence will provide a learning environment that encourages curiosity, deep thinking, and decision-making skills.

Artificial Intelligence will improve critical thinking skills by providing comprehensive and verifiable information, enabling students to compare various references in understanding PAI(Vernanda, Dewi, Jayanti, Bina, & Informatika, 2025). Through the use of Natural Language Processing (NLP) technology, students can

access various texts, religious texts, and religious literature from ancient times. The process of comparing these references helps students develop interpretive and evaluative skills. They do not just passively accept a single understanding but are also used to determine the relevance of arguments, identify differences, and understand specific contexts. Critical thinking skills emerge when students begin to analyze the differences in the opinions mentioned above. The results of Artificial Intelligence analysis can be used by teachers to enrich classroom discussions, make learning more interactive, and accelerate the analytical process. In this way, Artificial Intelligence serves as a bridge between classical philosophy and contemporary intellectual challenges that encourage critical thinking.

The impact of Artificial Intelligence on critical thinking skills can also be demonstrated through problem-based learning or problem-based simulations enabled by digital technology(Zabeta & Sholeha, 2025). Through visual scenarios that depict current issues, such as social ethics, tolerance between individuals, or decision making, students are trained to analyze situations in depth. They must identify the main problems, reinforce concepts, and present logical arguments. Artificial Intelligence assists by providing supporting data and reference recommendations so that students can conduct research in a more structured manner. This activity improves critical thinking skills, especially in the areas of analysis, synthesis, and evaluation. As a result of students' active participation in gathering information and generating ideas, Artificial Intelligence has been able to develop critical thinking skills that are more relevant to their daily lives.

Challenges faced by teachers and schools in integrating Artificial Intelligence

Integrating Artificial Intelligence into Islamic religious education, schools also face significant challenges related to infrastructure and facilities(Anshori, Husaini, & Islam, 2025). Not all schools have adequate internet connections, computers, or other equipment needed to run Artificial Intelligence applications optimally. This situation makes the implementation of Artificial Intelligence-based education unreliable, especially in educational institutions. In addition, there are costs associated with

accessing premium Artificial Intelligence platforms and developing technology so that schools with limited budgets can reap the benefits. Another challenge arises when schools need to provide data security and student privacy because Artificial Intelligence applications generally collect sensitive personal data.

In addition to technical challenges, research conducted by(Hidayat, Sumarna, & Hyangsewu, 2024) shows that pedagogical considerations are very important for Islamic education teachers when utilizing Artificial Intelligence (AI). This is because the use of technology must remain focused on achieving educational goals, not just the use of tools. Teachers are required to align traditional teaching methods with data-based adaptive learning models. However, this change requires an understanding of how Artificial Intelligence can be used to support ethical analysis, moral reflection, and critical thinking. Many teachers are still under pressure to engage in Artificial Intelligence-based activities without adhering to Islamic principles and values. Over-reliance on technology is feared to hinder emotional interaction and communication between teachers and students. The integration of Artificial Intelligence in religious education requires pedagogical adjustments to ensure that Islamic principles are upheld.

A journal written by (Arvin et al., 2023) shows that artificial intelligence has great potential for education, but efforts are needed to overcome challenges in its implementation. These challenges include improving teachers' digital literacy. In the context of Islamic education, additional challenges may include ensuring that the use of Artificial Intelligence remains in line with Islamic values and principles. Without clear regulations and supervision, the use of Artificial Intelligence has the potential to cause misunderstandings in religious content generated by the system. Resistance to new technologies often arises due to a lack of socialization, minimal training, and uncertainty about their long-term impact on pedagogy.

The results of this study indicate that the use of Artificial Intelligence (AI) in Islamic religious education can help students improve their critical thinking skills through automatic analysis, adaptive learning, and NLP-based interactions. This is in line with the findings of(Putri et al., 2023), which state that Artificial Intelligence (AI)

can improve students' cognitive processes by providing diverse perspectives on a concept. Additionally, (Nisa et al., 2025) state that adaptive learning allows students to access information according to their abilities, resulting in a more effective evaluation process. Compared to Vygotsky's constructivism theory, the use of Artificial Intelligence (AI) is consistent with the concept of scaffolding, where technology serves as a tool for students to better understand religious concepts. As a result, this study shows that the use of Artificial Intelligence (AI) can optimize critical thinking processes by providing a learning environment. The findings of this study expand on the idea that Artificial Intelligence (AI) can optimize critical thinking processes by providing a safe, personalized, and structured learning environment.

Artificial Intelligence (AI) has far greater analytical capabilities than traditional learning methods (Sitorus, Murti, & Sitorus, 2024). Artificial Intelligence (AI) systems can process data, identify patterns of student understanding, and provide instant learning recommendations, encouraging students to evaluate themselves independently (Fajriati, Wisroni, & Handrianto, n.d.). This results in a significant increase in critical thinking skills because students not only receive information from their teachers, but also compare, verify, and analyze information from various Artificial Intelligence (AI) based sources. In addition, interaction with chatbots and natural language processing (NLP) allows users to explore the meanings of words and phrases, making it easier for them to commit crimes. This process is in line with Flavell's (1979) metacognitive theory, which states that understanding how to read independently is an important factor in the development of critical reading. As a result, the use of Artificial Intelligence as an analytical tool has become the main reason for the improvement in students' critical thinking skills.

To improve students' critical thinking skills, artificial intelligence (AI) is used to enable personalized and adaptive learning. When students receive appropriate material, they understand PAI concepts and identify problems. Artificial Intelligence then provides automatic feedback that explains the problems and provides additional references (Oktavianus et al., 2023). This process allows students to conduct more systematic evaluation and reflection. In addition, the use of Artificial Intelligence (AI)-

based visual scenarios makes it possible to respond to various real situations with better analysis and logic. They are expected to identify, develop, and apply solutions based on Islamic principles. This interaction improves argumentation skills, which leads to critical thinking. As a result, Artificial Intelligence becomes more flexible and responsive. The ability of Artificial Intelligence to provide exploratory learning experiences has improved critical thinking skills(Zabeta & Sholeha, 2025). Artificial Intelligence enables students to access various aspects of Islam, interpretation, and literature, allowing them to compare and understand the historical context of a verse. This ease of access to information allows users to ask questions, analyze data, and determine which students should focus on exploration and problem solving. This environment encourages intellectual growth, which is essential for critical thinking. Therefore, ease of exploration has become one of the most important aspects of research.

D. Conclusion

The use of artificial intelligence (AI) significantly improves the effectiveness of Islamic Religious Education (IRE) teaching and has great potential in developing students' critical thinking skills. Based on the literature review, it was found that adaptive learning technology, Natural Language Processing (NLP), educational chatbots, and data-based evaluation are capable of creating a more interactive, personalized, and analytical learning process. Artificial Intelligence also helps students interpret religious texts more deeply, compare references, and assess the accuracy of information, thereby encouraging the development of evaluative and reflective skills. The contribution of this research lies in reinforcing the perspective that Artificial Intelligence is not only useful as a technical tool, but can also be a pedagogical instrument that supports learning that is more contextual, critical, and relevant to educational needs in the digital age.

This study has limitations because it only uses a literature review approach and therefore does not present empirical data from the field, even though it provides an assessment of the potential of artificial intelligence (AI) in Islamic Religious Education (IRE) learning. As a result, the findings of this study provide an empirical description

of how AI is actually used in the classroom. In addition, there has been no in-depth examination of how teacher readiness, moral dilemmas, and educational policy factors influence the use of technology in the classroom, using field research or mixed methods designs to obtain empirical data on the extent to which AI enhances critical thinking. AI-based education models that are more in line with Islamic principles and relevant to 21st-century learning needs should also be explored in future research.

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