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PGMI Students' Perceptions of the Implementation of Artificial Intelligence (AI) Technology in Learning in Madrasah Ibtidaiyah

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ABSTRACT

The development of Artificial Intelligence (AI) technology in the era of the Industrial Revolution 4.0 has a significant impact on the world of education, including in Madrasah Ibtidaiyah (MI). This transformation demands the readiness of teachers, especially prospective madrasah teachers, to adopt the technology without ignoring Islamic values. This study aims to explore the perceptions of Madrasah Ibtidaiyah Teacher Education (PGMI) Study Program students towards the implementation of AI technology in learning in MI. The study used a descriptive qualitative approach with the participation of 40 PGMI students of UIN Raden Fatah Palembang. Data were collected through an open-ended questionnaire and analyzed using thematic analysis method with the help of NVivo 14 software. The results showed that students have a fairly good understanding of AI as an intelligent technology that supports personalized and interactive learning. The main challenges in implementing AI in MI include limited infrastructure, funding, digital literacy, and resistance to change. Students emphasized the importance of mastering technology skills as a core competency of prospective MI teachers. This study recommends the integration of AI-based technology training in the PGMI curriculum to prepare adaptive and competent educators in the digital era.

1. Introduction

The massive development of digital technology in the era of the industrial revolution 4.0 has driven fundamental transformations in various fields of life, including in education. Artificial Intelligence (AI) as one of the innovative technologies today has become a catalyst for significant changes in the learning process at various levels of education (Yahya et al., 2023). The presence of AI in the education system not only changes the way teachers teach but also how learners learn and process information. According to (Wahyudi & Jatun, 2024), the integration of AI technology in learning has created a new paradigm in education that is more adaptive, personalized, and oriented towards future competencies. In the context of Islamic basic education, especially in Madrasah Ibtidaiyah (MI), the implementation of AI technology provides both challenges

and opportunities to modernize the learning system without abandoning Islamic values which are the fundamental basis of education in madrasah.

Madrasah Ibtidaiyah as an Islamic primary education institution has unique characteristics that distinguish it from primary schools in general, namely the integration of the national curriculum with the Islamic religious curriculum. In recent years, there has been a strong push to adopt technological innovations in learning in MI as a response to the demands of 21st century competencies and the times (Chakim & Bimantara, 2023). However, the implementation of AI technology in Madrasah Ibtidaiyah does not always run smoothly due to various factors such as limited infrastructure, teacher readiness, and concerns about the potential negative impact of technology on Islamic values. As expressed by Diantama (2023), the main challenge in integrating AI technology in madrasah is to create a balance between technological advancement and the preservation of spiritual values and Islamic character which is the spirit of education in madrasah.

The role of Madrasah Ibtidaiyah Teacher Education (PGMI) Study Program students as prospective educators in MI is very strategic in the context of the implementation of AI technology. Their perception and readiness in facing the development of educational technology will determine the future of learning in madrasah. Research conducted by Taufik et al., (2025) shows that there is a positive correlation between prospective teachers' positive perception of technology and their ability to integrate the technology in learning practices. Thus, understanding the perceptions of PGMI students towards the implementation of AI in learning is a crucial first step to prepare a generation of educators who are adaptive and competent in facing the digital era in the Islamic education environment.

Digital transformation in Islamic education, particularly in MI, has been the focus of research in recent years. Ubaidillah & Ulliyah, (2024) in their research found that the utilization of AI technology in learning in madrasah can significantly improve learning effectiveness and student learning outcomes. Correspondingly, Hendaryan et al., (2022) highlighted the importance of digital literacy for madrasah teachers as a prerequisite for the successful implementation of AI-based educational technology. Although various studies have shown the positive potential of AI implementation in learning, there is still a knowledge gap regarding the readiness and perception of prospective madrasah teachers, especially PGMI students, towards this phenomenon.

Studies on the implementation of AI technology in learning in Madrasah Ibtidaiyah are still limited to technical and pedagogical aspects, while aspects of perception and readiness of prospective madrasah teachers have not received adequate attention. According to a study conducted by Isti'ana (2024), the majority of research on educational technology in madrasah still focuses on the impact of technology on learning outcomes, while aspects of human factors such as perceptions, attitudes, and readiness of teachers and prospective teachers are still minimally studied. This gap is important to bridge considering that the successful implementation of AI technology in learning is highly dependent on

human factors, especially teachers as the main facilitators of learning in the classroom.

The implementation of AI technology in learning in madrasah is also faced with special challenges related to religious content. As stated by Cahyaningrum (2023), the integration of AI in learning Islamic religious subjects requires a different approach than general subjects because of the spiritual dimension that needs to be maintained. This dilemma further strengthens the urgency to understand the perceptions and readiness of PGMI students as prospective teachers who will be responsible for integrating AI technology in the context of Islamic education. Research results Taufik et al., (2025) shows that prospective madrasah teacher students have concerns about the potential reduction of Islamic values in learning that relies too much on technology.

The paradigm shift in education due to the COVID-19 pandemic has accelerated the adoption of digital technologies, including AI, in learning at various levels of education including madrasah. According to Elyana et al., (2022), the experience of distance learning during the pandemic has opened the eyes of many madrasah education stakeholders to the great potential of digital technology in supporting learning. However, as revealed by Huda (2024), a comprehensive understanding of AI technology among madrasah educators is still limited, which has implications for the non-optimal utilization of AI in the learning process. This condition reinforces the urgency to equip prospective madrasah teachers, including PGMI students, with adequate knowledge and skills related to the implementation of AI technology in learning.

The development of AI technology itself has reached a stage that allows personalization of learning according to the needs and characteristics of students. According to Muntamah & Sikki (2025), AI's ability to analyze student learning data can help teachers identify student learning difficulties early and provide appropriate interventions. This potential is certainly very relevant to the context of education in madrasah which emphasizes a holistic and personal approach in guiding students. However, as noted by Huda (2024), ethical and philosophical challenges in the implementation of AI in madrasah need serious attention, especially related to the potential dehumanization of education and the reduction of the role of teachers as role models in Islamic character building.

Potential AI implementations to be developed in the madrasah environment, such as smart tutoring systems for Al-Qur'an Hadith subjects, automatic assessment systems for Arabic language learning, and AI-based Islamic character recognition applications (Nisa et al., 2025). These potentials open up new opportunities for the development of Islamic education that is more adaptive and relevant to the demands of the times. However, the successful implementation of various AI applications is highly dependent on the readiness and competence of madrasah teachers in adopting and adapting these technologies to the context of Islamic learning (Khorayah & Muhid, 2022).

Based on the background and research gaps described, this study focused on exploring the perceptions of PGMI students towards the implementation of AI technology in learning in Madrasah Ibtidaiyah. The scope of the study includes students' understanding of the basic concepts of AI and its application in education, their attitudes and views towards the integration of AI in learning in madrasah, challenges to the integration of AI in learning and what needs to be prepared as prospective teachers in implementing AI in Madrasah Ibtidaiyah.

2. Methodology

This research uses a qualitative approach with an interpretative descriptive method as described by Creswell (2014), which emphasizes the importance of understanding the meaning that individuals construct of their experiences in a particular social context. The main focus of this research is to explore students' perceptions of the utilization of Artificial Intelligence (AI) technology in learning in madrasah ibtidaiyah, both in terms of potential, challenges, and implications for the role of future teachers. The research subjects were 40 students of Madrasah Ibtidaiyah Teacher Education (PGMI) Study Program of Raden Fatah State Islamic University Palembang who were purposively selected based on their involvement in academic activities and understanding of the development of educational technology. The selection of informants was done by considering the diversity of academic backgrounds and the level of exposure to technology, in order to obtain rich and representative data.

Data collection was conducted through an open-ended questionnaire developed by referring to the principles of qualitative instrument development according to Patton (2002), namely flexible, open, and exploratory. The questions in the questionnaire were designed to explore various aspects of students' perceptions of AI, including cognitive (knowledge and understanding), affective (attitude and acceptance), and reflective perceptions related to their experiences and expectations. Prior to widespread use, the questionnaire was pilot tested on a small group of students to ensure content validity and ease of understanding of the questions. Data collection was conducted online using Google Form, which allowed students to fill in answers with flexible time and a wider range.

Data analysis was conducted using a thematic analysis approach that refers to the Braun and Clarke (2006) model, and is complemented by the Miles and Huberman (1994) approach which includes three main stages, namely data reduction, data presentation, and conclusion drawing/verification. The analysis process was conducted through six systematic steps: (1) transcription and familiarization of data, (2) initial coding of important phrases or statements, (3) search for theme patterns that reflect the core of participants' answers, (4) review of theme consistency, (5) defining and naming themes to conceptually construct meaning, and (6) compiling a holistic and argumentative narrative of findings. All these stages were supported by NVivo 14 software that facilitated automatic and manual coding, data classification, and visualization of connections between themes through network models. Data credibility and validity were strengthened

This understanding indicates that PGMI students have an initial picture of the role of AI as a technology that can support human cognitive work in education. AI is not only seen as a tool, but as an intelligent entity that is able to interact, evaluate, and respond according to the learning context. As explained by Rahadiantino (2022), AI in education includes various technologies such as machine learning, natural language processing, and recommendation systems designed to create a more personalized and effective learning environment. The dominance of the words "education", "ability", and "customization" in students' responses supports the understanding that AI is not just a digital tool, but part of an intelligent learning system that is able to detect students' needs and devise appropriate learning strategies. Therefore, the meaning of AI by PGMI students tends to be in line with the basic characteristics of AI as defined in recent academic literature.

PGMI students' understanding of the role of AI as an intelligent technology that is able to detect student needs and develop learning strategies adaptively is in line with the visualization findings in Figure 2 below.

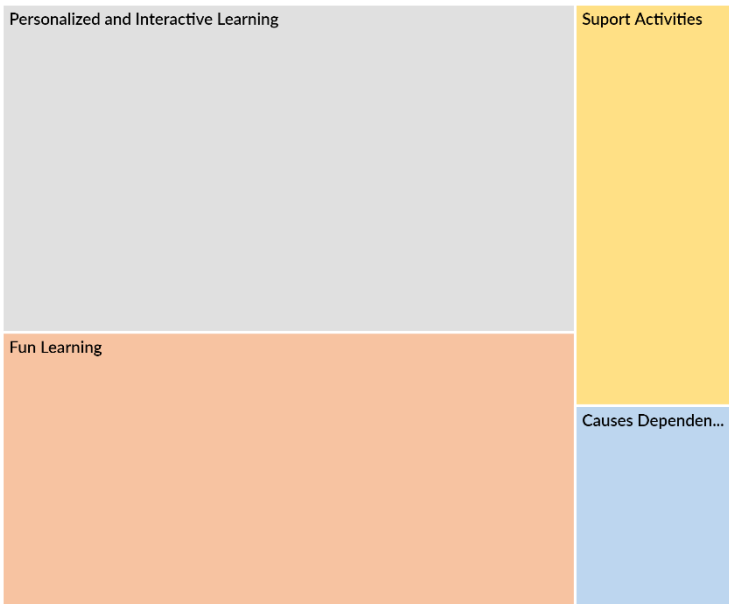


Figure 2. Hierarchy of Artificial Intelligence Application in Madrasah Ibtidaiyah

The visualization results in Figure 2 show that the "Personalized and Interactive Learning" category is the most dominant perception of PGMI students regarding the implementation of Artificial Intelligence (AI) technology in learning in Madrasah Ibtidaiyah. This indicates that students understand AI as a technology that is able to provide a personalized and interactive learning process. AI is considered to be able to identify the individual needs of each student and customize learning materials and approaches in real-time. Thus, the learning experience becomes more relevant, contextualized, and in accordance with the capacity of each learner. This perception is in line with the opinion of Kuncara et al., (2024) , which states that AI in education serves to map student profiles and customize learning methods based on their preferences, learning speed, and

learning style. This concept supports a differentiation-based learning approach, where students are no longer treated uniformly but according to their unique needs. In the context of Madrasah Ibtidaiyah, this approach is particularly important given the diversity of students' complex cognitive and social backgrounds.

In addition to being personalized, AI is also perceived as a technology that can create fun learning and encourage active student engagement. This is reflected in the dominance of the "Fun Learning" category in the visualization, which indicates that students see AI as a tool that is not only informative but also fun to use. The use of features such as interactive simulations, educational games, or smart chatbots are believed to increase student motivation and concentration during learning. AI also allows for quick feedback and automatic adaptation to students' difficulties, making them feel more supported and valued in their learning process. AI allows learning to be more responsive and dynamic, where students can learn at their own pace and still feel challenged (Afrita, 2023) . Therefore, it can be necessary to prepare knowledge of the challenges and things that need to be prepared in integrating AI in learning at the Madrasah Ibtidaiyah level.



Figure 3. Word Frequency of Artificial Intelligence Implementation Challenge in Madrasah Ibtidaiyah

Based on the analysis Figure 3, the word "infrastructure" emerged as the dominant factor in PGMI students' perceptions of the challenges of implementing Artificial Intelligence (AI) technology in learning in Madrasah Ibtidaiyah (MI). This suggests that infrastructure readiness is considered a key prerequisite in the integration of AI in the madrasah environment. Many madrasahs, especially in remote areas, face limited access to hardware such as computers and tablets, as well as unstable internet connections. Without adequate infrastructure, implementing an AI-based learning system becomes difficult. These limitations not only hinder technology adoption, but also have the potential to widen the gap in education quality between urban and rural areas.

In addition to infrastructure, other challenges identified include limited funding, digital literacy gaps, and resistance to change (Suryokta et al., 2023).

This training includes a basic introduction to AI technology, its application in basic education, and the ability to evaluate and develop AI-based learning media. In addition to formal training within the scope of the campus, students also suggested workshops, seminars, and digital internship programs in madrasas that have begun to apply technology in learning. These steps are believed to accelerate the technology adaptation process while increasing students' competence in a practical and applicable manner. This practical approach is effective in forming conceptual and technical understanding simultaneously in the learning process of prospective teachers (Septiani & Hanafi, 2022). Thus, technological readiness is not only a discourse, but is implemented in the professional capacity development of MI teachers in the future.

4. Conclusion

Based on the research results, it can be concluded that PGMI students have a fairly good understanding of the basic concepts of Artificial Intelligence (AI) and its strategic role in education. They do not only see AI as a tool, but as an intelligent system that is able to adapt learning to the needs of individual learners. The dominant perception shows that AI is considered capable of supporting personalized and interactive learning. However, students also realize the challenges in its application in madrasah, such as limited infrastructure and digital literacy. Therefore, mastery of technology is an important competency for future teachers.

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