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Integration of Generative AI in Madrasah Ibtidaiyah Teacher Education: Bridging Theory and Practice

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Abstract: This study aims to explore the potential integration of Generative AI (GenAI) in Madrasah Ibtidaiyah (MI) teacher education, focusing on the role of this technology in bridging the gap between teaching theory and practice. Using a Library Research or Integrative Review approach, this study reviewed relevant literature from various reputable academic sources such as Google Scholar, Scispace, DOAJ, and Scopus, with a publication time span between 2015 and 2024. The research findings show that GenAI can improve the quality of teaching in MI by providing innovative and efficient tools, and supporting teachers' professional development. However, the implementation of this technology requires rigorous training for educators, development of adequate infrastructure, and supportive policies for the benefits to be optimally realised. The research also highlights the importance of a holistic approach, including the development of strong ethical policies and teaching strategies that are responsive to the needs of students in the digital age. It is hoped that the results of this study can serve as a reference in designing effective GenAI integration in MI teacher education, in order to support a more inclusive and quality education transformation.

Keywords: Teacher Education, Madrasah Ibtidaiyah, Library Research, Educational Transformation.

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A. INTRODUCTION

Generative Artificial Intelligence (GenAI) is a branch of artificial intelligence that uses machine learning models to generate new content, such as text, images, or music, based on patterns and structures learnt from existing data. In the context of education, GenAI offers great potential to enhance the learning process by providing personalised and adaptive experiences. According to the Centre for Teaching Innovation (2024), GenAI can assist educators in designing more creative and relevant learning materials. In addition, UNESCO (2023) emphasises the importance of a human-centred approach in the application of GenAI in education, taking into account ethical aspects, data privacy and equality of access.

Research by Nyaaba (2024) suggests that in developing countries such as Ghana, GenAI can help address challenges in teacher education, such as the limitations of pedagogical models and the gap between theory and practice. By providing rich and interactive learning resources, GenAI enables prospective teachers to develop a deeper understanding of teaching materials and teaching strategies. The study by Ghimire et al. (2024) found that most educators have a positive attitude towards the use of GenAI in education, although there are still

concerns regarding its accuracy and ethical use. This suggests the need for training and clear guidance for educators in integrating GenAI into their teaching practices.

In the context of teacher education, GenAI integration can enrich the learning process by providing tools that support the development of pedagogical competence. The study by Nyaaba et al. (2024) revealed that prospective teachers use GenAI as a learning partner and teaching assistant to access learning materials, design teaching strategies, and develop assessments. However, the study also noted that factors such as age and education level influenced the frequency of GenAI use, while perceptions of GenAI remained consistent across groups. These findings highlight the importance of a customised approach in training prospective teachers in the use of GenAI.

While GenAI offers a wide range of benefits in education, there are challenges that need to be overcome, particularly in relation to ethics, privacy, and potential bias in the generated content. Noroozi et al. (2024) emphasised the need for a strong ethical framework to ensure the responsible use of GenAI in education. In addition, UNESCO (2023) recommended the development of comprehensive national policies to regulate the use of GenAI in the education sector, including data protection and training for educators. This approach is important to ensure that the integration of GenAI in teacher education is done safely and effectively.

In Indonesia, especially in the context of Madrasah Ibtidaiyah (MI), the integration of GenAI in teacher education is still a relatively new area that has not been widely explored. There are not many studies that specifically address the application of GenAI in MI teacher education, so there is a knowledge gap that needs to be filled. In addition, the adaptation of this technology in the local context requires an approach that considers cultural values and the specific needs of education in MI. Thus, this study aims to explore the potential integration of GenAI in MI teacher education, focusing on how this technology can bridge the gap between theory and practice in teaching.

B. METHOD

This study uses a Library Research or Integrative Review approach, which combines various relevant literatures to provide a comprehensive overview of the topic under study. This approach allows researchers to explore existing literature, integrate findings from various sources, and develop a broader understanding of the application of GenAI technology in teacher education in Madrasah Ibtidaiyah (MI). This method will provide a deep insight into the potential, challenges, and implications of GenAI integration in MI teacher education, as well as how this technology can influence teaching practices.

The data sources that will be used in this study include scientific articles available on leading academic platforms, such as Google Scholar, Scispace, Directory of Open Access Journals (DOAJ), and Scopus. These sources were chosen because they provide peer-reviewed articles that can be relied upon to obtain valid and up-to-date information. The focus of the literature search will be limited to the publication period between 2015 to 2024, to ensure that the included research is relevant to recent developments in education and technology.

The literature search process will be conducted using relevant keywords, such as ‘GenAI’, ‘teacher education’, ‘Madrasah Ibtidaiyah’, and ‘educational technology’. The search will focus on articles that discuss the integration of technology, particularly GenAI, in education and

teaching. The literature found will be screened based on its relevance, quality, and contribution to the purpose of this study. The literature selection procedure will include a first stage of screening based on titles and abstracts, followed by further evaluation of the quality of the research methodology and appropriateness to the topics covered.

The data analysis method used in this research is thematic analysis, which aims to identify key themes and patterns that emerge from the selected literature. Each article will be analysed to gain insights into how GenAI is applied in education, the challenges faced, and the opportunities that can be exploited. The validity and reliability of the results of this study will be obtained through the use of credible and relevant literature, as well as source triangulation to ensure that the findings obtained are reliable and reflect the true state of affairs in the context of teacher education in Madrasah Ibtidaiyah.

C. RESULTS AND DISCUSSION

1. The Potential of Generative AI in Improving the Quality of Learning in Madrasah Ibtidaiyah

The integration of Generative AI in education, especially in Madrasah Ibtidaiyah, has the potential to significantly improve the quality of learning. Generative AI offers a more personalised approach to meet the unique needs of each student, improve learning efficiency, and provide a more engaging and interactive learning experience. Utilising this technology, students can receive teaching materials tailored to their learning style and pace, which is crucial to support understanding and retention of information (Jayavardhini, 2024; Zhi-yi, 2024).

One of the practical applications of Generative AI includes the development of adaptive learning systems that can assess student progress in real-time and provide appropriate feedback. This is in accordance with research showing that AI-based technologies can increase student engagement, enable collaborative learning, and assist in evaluating learning outcomes more effectively (Trang & Thư, 2024; (Pratama et al., 2023). Through advanced AI allowances, such as personalised learning and automated assessment, Madrasah Ibtidaiyah can better respond to students' needs, especially in the context of inclusive and diverse education.

However, while the potential is promising, the challenges of integrating these technologies cannot be ignored. For example, the digital divide, the need for training for educators, and ethical and privacy issues are major concerns (Pratama et al., 2023). Therefore, it is important for educational institutions to develop a framework that ensures responsible and student-centred implementation of AI. This development framework can involve stakeholders in education to identify aspects that need improvement and ensure that AI applications are ethical and inclusive (yman & Mohamed, 2023)..

2. Challenges in Integrating Generative AI into the MI Teacher Education Curriculum

The integration of Generative AI into the teacher education curriculum in Madrasah Ibtidaiyah (MI) faces complex and multifaceted challenges. Some of these include infrastructure issues, educator training, ethical understanding, and risks to academic integrity.

To explore this aspect further, a comprehensive analysis is needed so that these challenges can be effectively addressed.

Firstly, a major challenge in integrating Generative AI is the infrastructure required to support its use. Many educational institutions, including Madrasah Ibtidaiyah, may not have adequate access to the necessary digital technologies and hardware that support AI implementation (Zakwani et al., 2025; Ali & Wardat, 2024). Without adequate infrastructure, the use of AI in the curriculum may be hampered, making it difficult to achieve the maximum benefits of this technology. In addition, technical challenges include the need for substantial training for teachers. Teachers must be trained not only to use AI tools, but also to understand how to develop teaching methods aligned with AI-based pedagogy (Ali & Wardat, 2024).

Secondly, issues of ethics and academic integrity are important concerns in the integration of generative AI in the educational curriculum (White & Huber, 2024; Wirzal et al., 2024). The propensity for plagiarism increases when students rely on AI to generate content. The development of strict policies regarding the use of AI in education is essential to ensure that students keep learning and developing their critical skills (Fatmadiwi et al., 2025). In addition, it is important to provide a deep understanding of the limitations and responsibilities of using AI tools, so that they do not misuse them in the teaching and learning process (Polat, 2024).

3. Gaps between Theory and Practice in the Use of Generative AI in MI Teacher Education

The gap between theory and practice in the use of Generative AI in Madrasah Ibtidaiyah (MI) teacher education reflects the complex challenges that need to be addressed for this technology to be effectively integrated into the curriculum. While there is a wealth of research supporting the potential of Generative AI in improving pedagogy and teaching skills, practice in the field often does not align with existing theory (Pratiwi et al., 2025; Davis, 2024).

One of the main issues is the lack of adequate training and professional development for teachers. Many current education programmes do not prepare prospective teachers to deal with and utilise rapidly evolving AI technologies. Research shows that professional development (PD) programmes that emphasise AI education can increase teachers' confidence in implementing AI-based pedagogy (Davis, 2024; Kandlhofer & Steinbauer, 2018). However, many teachers feel unprepared to use AI in their teaching due to the limited training received (Pratiwi et al., 2025). This leads to the inability to apply the concepts learnt from theory in the real context of the classroom.

In addition, this gap is also caused by the lack of tools and infrastructure that support the application of AI in education (Arruda & Arruda, 2024). In many institutions, including MI, access to the tools and technologies required to use AI effectively is still limited. This lack of resources prevents teachers from applying the theories they are supposed to learn. Research has shown that the successful integration of AI in education largely depends on the readiness of the infrastructure and the support provided to teachers (Dergaa et al., 2023).

D. CONCLUSIONS AND SUGGESTIONS

The integration of Generative AI in Madrasah Ibtidaiyah (MI) teacher education has great potential to improve teaching quality and bridge the gap between theory and practice. However, to optimally utilise this technology, an approach is needed that not only relies on

technology, but also involves rigorous training for educators. By strengthening teachers' ability to use these technologies, as well as providing supportive infrastructure and policies, Generative AI can create a better and more inclusive learning environment in Madrasah Ibtidaiyah. Awareness of the challenges and potential, and the development of adaptive and responsive teaching strategies, will ensure that Generative AI can support significant educational transformation.

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