

Utilization of Digital Technology in Enhancing Teachers' Pedagogical Competence

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ABSTRACT: This study aims to analyze the utilization of digital technology in enhancing teachers' pedagogical competence in madrasahs in Jombang Regency. The research employs a qualitative approach with a case study method. Data were collected through interviews, observations, and document analysis involving teachers, madrasah principals, and students. The findings indicate that digital technology has positively impacted teachers by enhancing their creativity and teaching effectiveness. The use of learning applications such as Google Classroom, Zoom, and Quizizz has helped teachers deliver lessons more interactively. Moreover, the integration of technology into learning has increased student engagement, particularly in discussions and group work. The study also reveals several challenges in implementing digital technology, such as limited infrastructure, lack of teacher training, and disparities in students' readiness. Some madrasahs still struggle with providing stable internet access and adequate learning devices. Additionally, resistance among some teachers due to limited digital skills and the time required to adjust teaching methods remains a challenge. To address these issues, strategies such as continuous teacher training, improvement of technological infrastructure, and the development of a more adaptive technology-based curriculum are necessary. By implementing these measures, the utilization of digital technology can be optimized to support the enhancement of teachers' pedagogical competence and the quality of learning in madrasahs in Jombang Regency.

Key words: *Digital Technology, Pedagogical Competence, Teachers, Madrasah, Learning*

INTRODUCTION

In today's rapidly evolving digital era, integrating technology into education has become imperative. Digital transformation has significantly influenced various aspects of life, including the education system. One of the most affected aspects is teachers' pedagogical competence, which encompasses the ability to design, implement, and evaluate learning effectively (Sheffield dkk., 2018). Digital technology offers innovative solutions that help teachers enhance learning effectiveness, develop more engaging teaching methods, and tailor the learning process to students' needs. In Jombang Regency, where madrasahs serve students from diverse social and economic

backgrounds, the use of digital technology plays a crucial role in improving the quality of education.

Enhancing teachers' pedagogical competence through digital technology is not merely a trend but a necessity in response to curriculum development and the demands of 21st-century education (Adiawaty, 2023). Technology enables teachers to access various learning resources, design multimedia-based lessons, and implement more interactive and data-driven teaching methods. Furthermore, digital technology facilitates personalized learning, allowing teachers to tailor lesson materials to students' comprehension levels and needs. In the context of madrasahs, which integrate Islamic values with general education, technology can help harmonize academic aspects with religious values in the educational process.

The implementation of digital technology in improving teachers' pedagogical competence in madrasahs does not always proceed smoothly. Several obstacles persist, including teachers' readiness to adopt technology, infrastructure limitations, and the level of support from madrasah administrators and government policies (Veletsianos dkk., 2021). Many teachers face difficulties in operating digital devices, understanding educational software, and integrating technology into effective teaching strategies. Additionally, some madrasahs in Jombang Regency struggle with limited internet access and insufficient supporting facilities, hindering the optimal use of technology in learning.

As part of the government's education digitalization program, various initiatives have been undertaken to enhance teachers' digital competence, including training and technology-based mentoring. These training programs aim to equip teachers with skills to manage digital classrooms, utilize online learning platforms, and develop technology-based learning media (Ma dkk., 2024). The effectiveness of these programs needs further evaluation, particularly regarding their implementation in madrasahs, which have distinct characteristics compared to general schools. Therefore, an in-depth study is required to assess the extent to which digital technology can enhance teachers' pedagogical competence in madrasahs and identify the factors that support or hinder its implementation.

The impact of digital technology on learning quality is an essential aspect to consider. This study seeks to identify how technology not only assists teachers in delivering lesson materials but also enhances students' active participation in learning (Chaanpraserta dkk., 2024). The use of technology such as e-learning, educational videos, interactive applications, and digital learning management systems can create a more dynamic and engaging learning environment. Hence, this study

focuses not only on teachers as educators but also on students' learning experiences in technology-supported educational settings.

Madrasahs in Jombang Regency hold a strategic role in fostering a generation that excels academically while maintaining strong Islamic values. Therefore, the integration of digital technology must be conducted with pedagogical considerations relevant to the madrasah learning environment. Blended learning, flipped classrooms, and gamification are some strategies that can be applied in technology-based learning in madrasahs (Johnson dkk., 2024). This study will examine how these strategies are implemented by teachers and their impact on their pedagogical competence. Beyond internal factors related to teachers' readiness and madrasah infrastructure, this study also considers external factors such as government policy support, the role of the educational community, and parental involvement in technology-based learning (Sholeh dkk., 2024). Support from various stakeholders is crucial to ensure the successful implementation of technology in education, thereby significantly enhancing teachers' pedagogical competence.

Based on the above discussion, this study aims to explore how digital technology can enhance teachers' pedagogical competence in madrasahs in Jombang Regency. It also seeks to identify challenges and opportunities in technology integration within learning and formulate strategic recommendations to improve the effectiveness of technology utilization in supporting teachers' professionalism in madrasahs. This research is expected to contribute to the development of technology-based education policies and serve as a reference for madrasahs in designing more innovative and effective learning strategies.

METHODE

Research Approach

This study employs a qualitative approach aimed at gaining an in-depth understanding of how the use of digital technology can enhance teachers' pedagogical competence in madrasahs in Jombang Regency (Shull dkk., 2008). A qualitative approach is chosen because it allows researchers to comprehensively explore phenomena through direct interaction with research subjects while understanding the social and cultural contexts underlying the use of technology in learning.

Research Design

The study utilizes a case study method, in which the researcher will intensively examine several madrasahs in Jombang Regency that have implemented digital technology in the learning process. A case study is selected as it provides an opportunity to explore phenomena in greater detail within a natural setting. This method enables

the researcher to observe how teachers use technology in the teaching and learning process and to identify factors that support or hinder the implementation of digital technology in improving their pedagogical competence.

Research Subjects and Location

The research subjects are madrasah teachers in Jombang Regency who have integrated digital technology into their teaching. Additionally, madrasah principals and students are involved as supporting informants to gain a broader perspective on the impact of technology utilization in education. The selection of madrasahs as research locations is conducted purposively, based on specific criteria such as the level of technology adoption, infrastructure readiness, and policy support for digital learning innovation.

Data Collection Techniques

Data collection in this study is conducted using several techniques, including in-depth interviews, observations, and document analysis (Yin, 2009).

In-Depth Interviews: Interviews are conducted with teachers, principals, and students to understand how digital technology utilization influences teachers' pedagogical competence. Semi-structured interviews are employed to allow informants the freedom to express their views while ensuring that responses remain relevant to the research focus.

Observations: Direct classroom observations are carried out to examine how teachers implement technology in learning. The researcher records the strategies used, the effectiveness of digital-based teaching methods, and students' responses to the applied technology. This observation aims to provide a factual depiction of the implementation of digital technology in enhancing teachers' pedagogical competence.

Document Analysis: Document analysis involves reviewing madrasah policies regarding technology use in learning, syllabi or lesson plans (RPP) that integrate technology, and assessments of digital media-based learning outcomes. This technique allows the researcher to explore how curriculum and educational policies support or hinder technology utilization in the teaching and learning process.

Data Analysis Techniques

The collected data is analyzed using the interactive model of Miles, Huberman, and Saldaña, which consists of three main stages (Miles dkk., 2014):

Data Reduction: Data from interviews, observations, and documents are selectively analyzed to filter relevant information based on the research focus. Irrelevant or excessive data is eliminated, while significant information is categorized into specific themes.

Data Presentation: The reduced data is then structured in the form of narratives, tables, or diagrams to facilitate understanding. This data presentation helps identify patterns related to the use of digital technology in improving teachers' pedagogical competence.

Conclusion Drawing and Verification: After analyzing the data, the researcher draws conclusions based on the findings. These conclusions are verified through data triangulation, which involves comparing information from multiple sources (interviews, observations, and documents) to ensure the validity of the research results.

Data Validity

To ensure data validity, this study employs source and method triangulation (Patton, 2002). Source triangulation is conducted by comparing information obtained from teachers, principals, and students. Meanwhile, method triangulation involves comparing results from interviews, observations, and document analysis. Additionally, member checking is conducted, in which informants are asked to review and confirm the interview results and research findings to ensure they align with their experiences.

RESULT AND DISCUSSION

Utilization of Digital Technology in Learning

The research findings indicate that most teachers in madrasahs in Jombang Regency have begun utilizing digital technology in the learning process. Based on interviews with teachers, they use various applications such as Google Classroom, Zoom, Quizizz, and Canva to assist in delivering learning materials. The use of these applications provides ease in presenting content more interactively and allows teachers to reach students with more varied methods. Additionally, online learning platforms enable students to access materials anytime and anywhere, allowing them to review lessons as needed.

Classroom observations also show that some teachers have integrated interactive media, such as educational videos and digital simulations, to enhance students' understanding of the material being taught. Educational videos, for instance, help students grasp abstract concepts more effectively through engaging visualizations. Meanwhile, digital simulations enable students to experience a deeper learning process, especially in subjects such as science and mathematics, which often require conceptual modeling. Thus, the use of digital technology not only enhances learning effectiveness but also encourages students' active engagement in the learning process (Sholeh, 2024).

Document analysis of lesson plans (RPP) reveals that not all teachers consistently integrate technology into their lesson planning. The use of technology remains sporadic and has not become a systematic part of their teaching strategies. This occurs because some teachers still lack confidence in incorporating technology into their teaching methods. Some only use technology when necessary, without carefully planning a technology-based learning strategy (Ristya Rini dkk., 2023).

The challenges encountered in implementing digital technology in learning vary. One of the main obstacles is the lack of adequate training for teachers on the use of technology in education. Most teachers admit that they have not received systematic training on how to integrate technology into effective teaching strategies. As a result, even though they have access to various digital platforms, their utilization remains suboptimal. Infrastructure limitations in some madrasahs also pose a challenge to the implementation of digital technology in learning. Not all madrasahs have the necessary facilities, such as a stable internet connection, adequate computers or laptops, and access to relevant educational software. Some schools still rely on conventional methods due to a lack of resources to implement technology in their teaching (Sholeh, 2023).

Another challenge faced is the resistance from some teachers who still feel comfortable with traditional teaching methods. Some teachers perceive that using technology adds to their workload because they must learn how to operate new software and adjust their teaching methods. Additionally, some still view technology merely as a supplementary tool rather than an integral part of the learning process. Several initiatives have been undertaken to address these challenges. Some madrasahs have organized internal training sessions for teachers to enhance their skills in using digital technology in teaching. Furthermore, the government and educational institutions have started providing support in the form of online training, workshops, and technological resources for schools in need (Minarti dkk., 2024).

Support from various stakeholders is essential to ensure that the use of digital technology in learning can be optimized. With adequate training and supporting infrastructure, teachers in Jombang Regency madrasahs are expected to become more confident in integrating technology into their teaching. This will positively impact the quality of education and help students develop 21st-century skills, which increasingly rely on digital technology. The utilization of digital technology in learning holds great potential for improving the effectiveness and quality of education in Jombang Regency madrasahs. However, to achieve optimal results, a more systematic strategy is needed for its implementation, including continuous teacher training and school infrastructure development. If these challenges can be addressed, digital technology can become a

highly effective tool for increasing student engagement and enriching their learning experience.

Enhancing Teachers' Pedagogical Competence through Digital Technology

The use of digital technology has proven to have a positive impact on improving teachers' pedagogical competence. Based on interviews, many teachers feel that technology helps them develop more innovative and engaging teaching methods for students. With various digital platforms such as Google Classroom, Canva, and Quizizz, teachers can design more interactive lessons and provide a more enjoyable learning experience for students. Technology also allows teachers to diversify their teaching methods, such as utilizing educational videos, digital simulations, and interactive quizzes that enhance student engagement in the learning process.

The use of digital technology boosts teachers' confidence in adopting technology-based teaching strategies and adapting their approaches according to students' needs. Technology enables them to adjust the pace and learning styles of each student, making learning more personalized and effective. It also allows teachers to use data and analysis of student learning outcomes to refine their teaching strategies. For example, with the analytics features available on digital learning platforms, teachers can track student progress more comprehensively and provide more specific feedback tailored to their individual needs (Habibullo dkk., 2024).

Observations conducted during the study also show that the use of digital technology has improved teacher-student interactions. In classrooms that incorporate technology-based learning, students are more active in asking questions and participating in discussions. Technology facilitates more dynamic two-way communication, such as through online discussion features in Google Classroom or interactive forums on other digital learning platforms. Teachers also have greater flexibility in delivering materials in various formats, such as interactive presentations, digital infographics, or simulations that enhance students' understanding of abstract concepts. This demonstrates that technology integration can improve teachers' communication skills and classroom management, which are essential aspects of pedagogical competence (Syafi'i & El-Yunusi, 2024).

The use of digital technology in learning assists teachers in evaluation and assessment. With various online assessment tools such as Google Forms, Kahoot, and Microsoft Forms, teachers can develop a more objective and efficient grading system. Additionally, technology-based assessments enable teachers to provide faster and more detailed feedback to students. This not only enhances learning quality but also helps students understand their mistakes and correct them more quickly.

Despite these benefits, there are still challenges in implementing digital technology to enhance teachers' pedagogical competence. Based on interviews with some teachers, difficulties remain in aligning technology-based learning with students' diverse characteristics. Some students, particularly those less familiar with digital learning, struggle to follow the materials, especially when learning takes place online. Teachers also face challenges in ensuring equal access to devices and stable internet connectivity for all students. Not all teachers possess sufficient technological skills to optimize the use of digital tools in teaching. Some teachers still feel uncertain about using digital platforms and require further training and support to integrate technology effectively into their teaching process. Therefore, continuous professional development programs are necessary to ensure that technology is used inclusively and effectively for all students (Habibulloh & Ridho, 2024).

To address these challenges, support from various stakeholders, including the government, schools, and educational technology providers, is required. The government and educational institutions can offer more comprehensive training on technology integration in teaching, including methods tailored to different student learning styles. Schools also need to support teachers by providing adequate infrastructure, such as stable internet connections and sufficient access to digital devices for both teachers and students. With proper training and better infrastructure support, teachers in Jombang Regency madrasahs can optimize their use of digital technology to enhance their pedagogical competence. Consequently, learning will not only become more engaging and interactive but also more effective in improving students' understanding. The systematic and continuous application of digital technology will contribute to the overall improvement of education quality.

Challenges in Implementing Digital Technology

Although digital technology offers significant benefits in the field of education, research findings indicate that various challenges persist for teachers and madrasahs in its implementation. One of the primary challenges is infrastructure limitations. Not all madrasahs in Jombang Regency have stable and adequate internet access. Some madrasahs in rural areas still struggle with providing technological facilities, such as a lack of computers, tablets, or projectors for digital-based learning. This condition results in uneven technology adoption, where madrasahs with better facilities can optimize technology usage, while those with limited resources face difficulties in keeping up with digital advancements.

Aside from infrastructure issues, interviews with madrasah principals also revealed resistance from some teachers toward using technology in teaching. Some teachers accustomed to conventional teaching methods feel that integrating

technology requires extra effort, both in understanding new software and in preparing digital-based learning materials. They perceive that creating digital teaching resources, such as interactive presentations, instructional videos, or online quizzes, takes more time compared to traditional methods. A lack of training and mentoring is also a major factor contributing to teachers' low readiness in adopting technology-based teaching methods (Swarat dkk., 2012).

The available training programs for teachers remain limited in scope and duration. Many teachers only receive brief training on technology, which is insufficient for mastering various educational applications optimally. Some teachers also report difficulties in overcoming technical issues during digital learning, such as network disruptions or device compatibility problems. Therefore, there is a need for more sustainable and practice-based training to help teachers feel more confident in effectively utilizing technology.

From the students' perspective, although most enjoy technology-based learning, some struggle to adapt to digital learning methods. Some students, especially those accustomed to direct lectures, feel that digital learning requires greater independence. When materials are presented in digital formats, such as videos or online modules, students must actively seek understanding on their own, unlike conventional methods that rely more on direct explanations from teachers. Students with limited digital literacy also face challenges in accessing and using online learning platforms optimally. Not all students have equal access to technological devices. Observations show that some students have to share devices with other family members, particularly those from lower-middle economic backgrounds. This results in limited time for them to access digital learning materials, which can ultimately affect their academic performance. Therefore, solutions are needed to bridge this digital gap, such as providing loaned devices from madrasahs or establishing computer labs that students can use in turns (Anggraeny dkk., 2020).

Another challenge in implementing digital technology is the lack of balance between direct interaction and technology-based learning. While technology enhances flexibility in the learning process, face-to-face interaction remains crucial in building students' understanding, particularly in discussions, collaboration, and direct teacher guidance. Some students express that they receive less individual attention from teachers when learning is conducted online or through technology, compared to conventional classroom settings. Therefore, teachers need to integrate technology with teaching approaches that still allow for direct interaction, whether through discussion sessions, consultations, or group work involving direct communication between teachers and students.

The government can play a role in improving infrastructure in madrasahs that still lack technological access. Meanwhile, madrasahs can implement mentoring programs for teachers who struggle with adopting technology and ensure that all students have equal opportunities to access digital learning. With continuous training, improved infrastructure, and a more balanced teaching approach, the challenges in implementing digital technology can be minimized. This will enable madrasahs in Jombang Regency to integrate technology more effectively into the education system, not only enhancing teachers' competencies but also providing a more effective and inclusive learning experience for all students.

Strategies for Strengthening the Implementation of Digital Technology in Learning

The utilization of digital technology in learning at madrasahs in Jombang Regency continues to develop. However, to optimize its implementation and ensure a positive impact on teachers' pedagogical competence, a systematic and sustainable strategy is required. Based on research findings, several strategic steps can be applied to strengthen the use of digital technology in education. One of the main challenges in implementing digital technology is the lack of teachers' skills in using technology-based learning devices and applications. Therefore, more intensive and continuous training is an urgent need. Research results indicate that one-time or short-term training is insufficient to provide teachers with an in-depth understanding. They need competency development programs that cover various aspects, from technical comprehension to the application of technology-based pedagogical strategies.

This training should be designed in the form of practical and project-based sessions, so that teachers not only understand theories but can also immediately implement technology in their teaching process. Additionally, mentoring by experienced facilitators in educational technology can help teachers overcome challenges during implementation. With structured and continuous training, teachers are expected to become more confident and skilled in utilizing digital technology in learning. To ensure the smooth implementation of digital technology, adequate infrastructure is a crucial factor that cannot be overlooked. Research findings indicate that one of the biggest obstacles in technology utilization at madrasahs is the limited access to stable internet and a lack of digital devices such as computers, tablets, and projectors (Chowdhry dkk., 2014).

Investment in improving technological infrastructure at madrasahs is necessary, especially in areas with limited access. The government and relevant stakeholders need to collaborate to provide more equitable digital facilities, ensuring that all students and teachers have equal opportunities to access technology for learning purposes. Additionally, madrasahs can seek alternative solutions, such as rotating the use of

computer labs or partnering with private institutions to provide digital devices. Besides hardware, other technical aspects, such as training for madrasah technicians, should also be considered. Having technical personnel who understand how to maintain and repair technological devices can help address technical problems that often arise in classroom technology use without disrupting the learning process.

For digital technology to be effectively utilized in learning, a more flexible curriculum that adapts to technological advancements is essential. Document analysis reveals that most madrasahs still use curricula that are not fully integrated with digital technology. Madrasahs need to develop policies that allow for the systematic integration of technology into lesson planning. Each lesson plan (RPP) should incorporate the use of technology relevant to the subjects being taught. Furthermore, teachers should be given the freedom to explore various digital learning platforms that can support the delivery of materials in a more engaging and interactive manner.

The integration of technology into the curriculum should also be accompanied by regular evaluations to ensure its effectiveness in improving learning quality. Feedback from teachers and students is crucial to determine the extent to which technology genuinely helps achieve the desired learning objectives. Not all students have the same readiness for technology-based learning. Therefore, implementing inclusive learning strategies is vital. Teachers need to adopt an approach that combines conventional methods with digital technology to ensure that all students can follow lessons optimally (Al-adwan & Smedley, 2012).

Some students who are less familiar with technology may struggle to adapt to digital learning methods. To address this, teachers can provide additional guidance or offer materials in various formats, such as videos, text, and live discussions, allowing students to choose the method that best suits their learning style. Technology-based learning should not only focus on the use of digital devices but also prioritize interaction and collaboration among students. The use of technology in learning should be designed to enhance student engagement through online discussions, virtual group work, and digital projects that allow students to share ideas and experiences.

The implementation of digital technology in learning at madrasahs in Jombang Regency holds great potential for improving teachers' pedagogical competence and the effectiveness of the teaching-learning process. However, to achieve optimal results, a comprehensive strategy is needed, encompassing continuous teacher training, technological infrastructure improvement, adaptive curriculum development, and inclusive learning approaches. With the right support from various stakeholders, including the government, madrasahs, and the education community, challenges in implementing digital technology can be minimized. These strategic steps are expected

to foster the creation of a more innovative, interactive, and 21st-century skill-oriented learning ecosystem for both students and teachers.

CONCLUSION

This study demonstrates that the utilization of digital technology plays a significant role in enhancing teachers' pedagogical competence in madrasahs across Jombang Regency. Through the use of various digital platforms such as Google Classroom, Zoom, and other interactive applications, teachers can develop more innovative, engaging, and student-centered teaching methods. Digital technology also enables teachers to access a broader range of learning resources and improve their skills in designing more systematic and effective teaching materials. Despite the numerous benefits of digital technology, this study also identifies several challenges in its implementation. The main obstacles include limited infrastructure, a lack of training for teachers, and varying levels of student readiness. Not all madrasahs have stable internet access or adequate digital devices, which hinders the smooth integration of technology into the learning process. Additionally, some teachers struggle to adopt technology due to limited skills and insufficient time to adapt to changes in teaching methods. To address these challenges, strategic measures are needed, such as continuous teacher training, the provision of adequate infrastructure, and the development of educational policies that support the integration of technology in teaching and learning. By implementing these strategies, the use of digital technology can be optimized to enhance teachers' pedagogical competence, ultimately improving the overall quality of education in madrasahs across Jombang Regency.

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