



Digital Competence in Science Pedagogy for Islamic Religious Education Teachers in Palembang City

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Abstract: This study analyzes the efforts to improve the digital Science pedagogy competence of PAI teachers at MAN 3 Palembang City, which is increasingly important in the digital era. Teachers are required to integrate technology in learning innovatively. This research uses a qualitative approach with a case study method and data collection techniques through observation, interviews, and documentation to explore the efforts made in improving these competencies. The overall explanation of the digital pedagogical competence of PAI teachers at MAN 3 Palembang involves several important steps. Teachers have a positive attitude towards ICT, in-depth knowledge, and the ability to apply it in learning through technology such as video, multimedia, and online discussion. They are skilled in planning, implementing, and evaluating learning with ICT, and continue to develop themselves according to students' needs. In addition, teachers are able to integrate learning theories with students' characteristics, thus creating relevant, interesting and effective learning to achieve the desired learning objectives.

Keywords: Competence; Digital science pedagogy; Islamic education teacher

Introduction

In today's digital era, the development of information technology is growing very rapidly, allowing information to be received in a matter of seconds (Febrian et al., 2021; Hidayah et al., 2023; Iskandar et al., 2023; Sriyanti, 2023). This progress has significant implications for the world of education. Teachers are not only required to be good at teaching conventionally, but must also be able to integrate technology in the learning process to create learning that is relevant to the needs of the times (Alharbi, 2025; Finnestrand, 2023; Yang & Wang, 2023; Yu, 2024). This integration, especially in Islamic religious education, can enrich students' learning experience through visualization of complex scientific concepts, such as simulation of natural phenomena, virtual experiments, and the use of data analysis software (Kurata et al., 2025; Lin & Ironsi, 2024; Yıldız et al., 2025).

The ability of teachers to utilize technology as a learning medium is very important (Fitriyah et al., 2024; Hardi, 2023; Jannah & Prodjosantoso, 2024; Laksono et al., 2023). With technology, teachers can create more interactive, engaging and efficient Islamic religious learning, and can adapt to the evolving needs of students (Haryanto et al., 2024; Salim et al., 2023; Saralee et al., 2024; Ummahati & Suprihatiningrum, 2024). For example, digital learning applications, online platforms and other digital resources provide opportunities for students to explore the Science concepts in Islamic religious education independently (Ozimek et al., 2024; Soeharto & Csapó, 2022; Tang & Tang, 2024; Valeri et al., 2024). This not only facilitates access to learning materials but also encourages the development of 21st century skills, such as critical, creative and collaborative thinking. Therefore, teachers' digital pedagogical competence, the ability to integrate technology with effective pedagogical approaches, is an urgent need in

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learning (Alismail, 2023; Liu et al., 2024; Tai & Zuo, 2024).

Education in Indonesia currently faces major challenges, especially in improving teacher competencies, including in Islamic religious education (Fauza et al., 2023; Kusumawati et al., 2021; Rabbani et al., 2023; Rizki et al., 2021). A survey conducted by the World Bank (2020) in Pesambili et al. (2022) highlighted the low quality of teachers in Indonesia. Based on the results of the 2018 Teacher Competency Test (UKG), the national average was only 53.02, below the minimum competency standard set at 55.0. A total of 27 provinces, including South Sumatra Province, recorded results below the minimum competency standard, with an average of 48.57. This low competency indicates the need for serious attention to improving teacher skills, especially in integrating technology into science learning integrated in Islamic Religious Education.

The results of research by Nguyen et al. (2025) revealed that teachers face several obstacles in implementing educational technology, such as low enthusiasm for learning and curiosity in operating ICT tools, difficulty using digital applications or platforms such as Zoom and Google Classroom, and limited supporting facilities and infrastructure. In addition, according to Rezai et al. (2024), the limited digital pedagogical competence of teachers often results in monotonous learning, including in the use of Science learning media, making it less effective in attracting student interest. This is emphasized by Tai et al. (2024), who states that the limited ability of teachers to use technology often hinders innovation and creativity in teaching.

In the context of science education, this constraint can reduce students' understanding of scientific concepts that require a visual and interactive approach. Based on this background, this study aims to explore teachers' digital pedagogical competencies, particularly in the context of Science and Islamic Religious Education learning in Palembang City. It also aims to identify challenges faced by teachers and provide strategic recommendations to improve their digital pedagogy competencies. By understanding the current conditions, it is hoped that the results of this study can serve as a foundation for policy making and relevant training programs, thus supporting the improvement of the quality of learning of Science and Islamic Religious Education in a holistic and sustainable manner.

Method

This research is a field research with a qualitative approach that aims to analyze field reality in depth and holistically. This study attempts to describe phenomena

in the context of natural conditions. The focus of the research is to explore the digital pedagogical competence of Islamic Religious Education teachers and its application in the context of science pedagogy at MAN 3 Palembang City. This study used a descriptive approach to understand the extent of technology integration in teaching PAI with a Science pedagogy approach and the obstacles faced.

Data collection was conducted through three main techniques. First, interviews were conducted with PAI teachers, the Head of Madrasah, and students to obtain data on teachers' digital pedagogy competencies. Questions focused on the utilization of technology in learning, digital pedagogy strategies relevant to the Science approach, and students' perceptions of the learning process. This technique allowed researchers to gain an in-depth understanding of the application of technology in the Science pedagogy approach. Second, observation was conducted to directly observe the learning process at MAN 3 Palembang City.

The researcher recorded teacher and student interactions, the use of digital learning media in the context of science pedagogy, and the overall learning atmosphere. This observation helped to obtain empirical data about the application of technology in science-based learning that requires a visual and interactive approach. Third, documentation was used to collect data in the form of records of the number of teachers and students, inventory of digital infrastructure, and PAI learning materials relevant to the Science pedagogy approach. This data is used to analyze the extent to which technology supports learning in madrasah, especially in the context of science pedagogy.

Data analysis was conducted qualitatively by following these steps. First, data reduction was carried out by summarizing, selecting, and focusing data according to the research topic. Irrelevant data were ignored to ensure that the results of the analysis remained focused on the digital pedagogical competencies of teachers in the context of science pedagogy. Second, data display is done by presenting data systematically through tables, diagrams, or descriptive narratives. This presentation helps researchers understand the context of teaching PAI based on science pedagogy in depth and facilitates drawing conclusions. Third, conclusion drawing and verification were conducted by drawing initial conclusions based on the data analysis that had been conducted. The findings were then verified through data triangulation, comparing the results of interviews, observations, and documentation. This process ensures data validity and accuracy of conclusions.

This study aims to provide a comprehensive overview of the digital pedagogical competencies of PAI

teachers in the context of Science pedagogy in Palembang City, as well as to identify the constraints and opportunities that exist in the application of technology in madrasah.

Result and Discussion

This study found that Islamic Religious Education (PAI) teachers at Madrasah Aliyah Negeri (MAN) 3 Palembang have digital pedagogy competencies that cover various important dimensions, including a positive attitude towards technology, in-depth knowledge of Information and Communication Technology (ICT), and skills in designing, implementing, evaluating and revising technology-based learning.

Teachers show a positive attitude towards ICT, as revealed in interviews with several respondents. Teachers view technology as an important tool that is integral to the learning process, providing convenience and innovation in teaching. This positive attitude is also evident from their active participation in various ICT-related trainings and seminars. Observation shows that this positive attitude motivates them to continuously improve their digital skills to create more interactive and relevant learning experiences for students.

In-depth knowledge of ICT is also one of the competencies teachers possess. They are able to use various learning applications such as Google Classroom, Google Meet, Canva, Kahoot and YouTube to support teaching. This allows teachers to enrich learning materials with multimedia shows, online discussions, and interactive content creation that increases student engagement.



Figure 1. Training and learning activities using ICT

ICT-based learning planning skills are also evident through the steps teachers take, such as identifying learning objectives, selecting relevant digital platforms, and compiling materials that are interesting and appropriate to students' needs. The implementation of technology-based learning is done systematically by utilizing tools such as projectors, laptops, and learning applications. In evaluation, teachers use formative and summative methods with technology-based tools to assess learning effectiveness and identify areas of improvement.

PAI teachers at MAN 3 Palembang are also able to integrate learning theories, current research findings and practical experiences into ICT-based learning designs. They use approaches such as blended learning and hybrid learning, which allow an effective combination of online and offline learning. This approach gives students the flexibility to access materials digitally, while maintaining face-to-face interaction.

This research shows that the digital pedagogical competence of PAI teachers at MAN 3 Palembang is at a good level. The teachers are able to integrate technology

with various pedagogical approaches that suit the needs of students in the digital era. Their positive attitude towards technology is an important foundation in supporting the successful integration of technology in learning. In addition, in-depth knowledge of ICT allows teachers to optimally utilize various learning tools, while the skills of planning, implementing and evaluating technology-based learning ensure the effectiveness of the teaching and learning process.



Figure 2. Madrasah evaluation or assessment (AM) activities

The findings of this study are in line with Chaiban et al. (2024) and Cabellos et al. (2024) research, which emphasized the importance of teachers' positive attitude towards ICT in integrating technology into learning. Cortes et al. (2025), Feng et al. (2024), and Khalil et al. (2024) also supported that teachers' positive attitudes encourage openness to innovation and continuous learning. In addition, Liu et al. (2024) points out that teachers' mastery of technology enables learning to be more effective and relevant to students' needs.

Approaches such as blended learning and hybrid learning used by PAI teachers at MAN 3 Palembang are also supported by Khalil et al. (2024), who stated that this approach is able to overcome the weaknesses of online and offline learning, creating a more balanced and flexible learning experience.

This research provides practical and theoretical implications. Practically, the results of this study can serve as a reference for other madrasahs in developing teachers' digital pedagogy competencies, especially in the context of religious learning which is often considered difficult to integrate with technology. Theoretically, the findings enrich the literature on teachers' digital pedagogical competence in the context of religious learning, as well as showing the relevance of technology-based approaches in religious education.

This study has limitations in that the sample coverage is limited to MAN 3 Palembang, so the results may not be fully generalizable to other madrasahs with different characteristics. In addition, more in-depth research methods such as experiments or longitudinal studies may provide more comprehensive insights into the impact of digital pedagogical competencies on student learning outcomes.

Based on the findings of this study, several recommendations can be made. First, there needs to be a more structured effort to improve teachers' digital pedagogical competence through continuous training that is relevant to the latest technological developments. Second, schools need to provide adequate technological infrastructure to support ICT-based learning. Third, further research needs to be conducted with a wider sample coverage and a more in-depth approach to understand the long-term impact of digital pedagogical competence on student learning outcomes.

Conclusion

The results showed that Islamic Religious Education (PAI) teachers at MAN 3 Palembang have digital pedagogy competencies that include six main aspects. First, teachers have a positive attitude towards Information and Communication Technology (ICT) and keep abreast of technological developments in learning.

Second, they have in-depth knowledge of ICT, including the use of various applications and learning platforms. Third, teachers are skilled in designing ICT-based learning with clear objectives and relevant media. Fourth, the implementation of learning is done effectively by involving students interactively through technology. Fifth, teachers are able to evaluate ICT-based learning and use the evaluation results for method improvement. Finally, teachers successfully integrate learning theories with students' characteristics, so that learning is more relevant, interesting, and supports the achievement of educational goals.

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