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Integration of TPACK Model in Islamic Religious Education Curriculum: An Analysis of Readiness and Barriers

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Abstract

Over the past decade, rapid technological advancements have significantly impacted various sectors, including education. In the context of Islamic religious education, integrating technology presents both opportunities and challenges, necessitating a comprehensive understanding of how to effectively blend technology with teaching content and values. However, research on the readiness and obstacles in implementing the TPACK model within the Islamic religious education curriculum is still limited. This study utilized a qualitative approach with case studies of five senior high schools in Pekanbaru to explore these issues. The results show significant variations in technology adoption and teacher readiness across the schools. Key factors in overcoming technological challenges include institutional support and professional training, with some schools achieving success through long-term investments in immersive technologies like AR and VR. These findings highlight the importance of adaptive and innovative approaches to address technological barriers in education. Theoretically, this study enhances the literature by providing empirical evidence on the crucial role of institutional support and professional training. Practically, it offers guidance for educational institutions to improve teacher and student readiness for technology integration. Although the study is limited by its small sample size, it provides valuable insights and recommends future research to explore new educational technologies further. Continuous investment in educational technology, sufficient professional training, and strong institutional support are essential for effective technology integration in Islamic religious education. These findings contribute to both theoretical understanding and practical applications, offering solutions to enhance educational quality through technology.

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Introduction

In the last decade, technology has undergone rapid development, significantly impacting various sectors, including education (Muhaimin et al., 2019). Usage of skill in the education and studying process not only supports more interactive and engaging learning activities but also allows access to extensive and varied learning resources (Saputra & Margana, 2023). Therefore, the combination of technology in learning has become a major focus in efforts to enhance the quality and value of learning. The availability of enlightening software, e-learning platforms, and other digital tools offers educators the opportunity to design more adaptive and personalized learning.

The TPACK model, which stands for Knowledge of technology, pedagogy and content, has emerged as an Important area that describes the competencies required by teaching staff, effectively Technological integration in teaching (Fakhriyah et al., 2022). The model brings together three main domains of knowledge: technology, pedagogy, and subject content (Astuti et al., 2023). The TPACK framework emphasizes that mastery of technology alone is not enough. Teachers also need to understand how technology can support effective teaching strategies and how it can be applied to teach subject content in greater depth. This shows that it is important a holistic method in teacher training so that Use of technology in learning becomes more meaningful.

Especially in Islamic religious education, the application of the TPACK model has its own nuances that present both challenges and opportunities. Islamic religious education teaches not only about faith and worship but also values, ethics, and ways of life that must be integrated into daily life (Lie et al., 2023). The use of technology in Islamic religious education can be an effective tool to reach students in innovative and relevant ways, in tune with their dynamic needs (Habibi et al., 2023). However, to achieve this, it requires a deep understanding of how technology can be integrated not only in teaching content but also in applying values and ethics in learning.

In an effort to enrich the literature related to integrating Technological Pedagogical Content Knowledge Model (TPACK) education curriculum, several studies have contributed significant understanding to this topic. Kristiawan et al. (2022), in an article titled "Impact of Call Professional Development for EFL Materials on Teacher Agency and Technological Pedagogical Content Knowledge (TPACK) in Indonesian Islamic Schools," explored the utilization of technology in English as a Foreign Language (EFL) learning in Islamic schools in Indonesia. The study found that through professional development workshops, EFL teachers in Islamic schools improved their ability to develop teaching materials that integrate technology and pedagogy, while incorporating their cultural and religious backgrounds.

Meanwhile, Umbase (2023) in his research entitled "Implementing Technological Pedagogical and Content Knowledge from the Social Studies Learning Management Perspective" revealed that teachers' executive information and services in utilizing TPACK are still in the reasonable group and manage to be lacking. This descriptive qualitative research suggests the importance of continuous training, technical guidance and internships to improve teachers' managerial abilities in implementing TPACK, especially in Social Studies learning. On the other hand, Priyanti (2019) in her research entitled "Influence methods of training for competence of technological pedagogical and content knowledge for (TPACK) PAUD teachers in Banten province" shows that training methods have a significant influence on the capability of TPACK/PAUD educators in Banten Province. Through the multistage cluster sampling method, it was found that the competency scores of teachers who underwent the coaching training method were higher than those who followed the mentoring method.

Studies have shown that factors such as infrastructure readiness, access to technology resources, and teacher training have a major influence on the success of technology integration in learning. The readiness of technology infrastructure in schools, such as the accessibility of computer hardware and software, stable net connection, and technical support, are basic prerequisites that must be met (Purnama et al., 2023). In addition, teachers need to be equipped with adequate training to optimize the use of these technologies in learning (Bahri et al., 2020). This training is not only about how to use technology tools, but more importantly how to integrate the technology into effective and engaging learning designs.

Although the importance of technology integration in education has been widely discussed, there are still research gaps, especially related to the readiness and obstacles in implementing the TPACK model in the Islamic religious education curriculum (Bahri et al., 2020). This raises questions about how schools and teachers can overcome these barriers and what are effective strategies to improve teachers' readiness to integrate technology in Islamic learning. Therefore, further research in this area will not only help identify the challenges faced by teachers and schools, but also provide insights into best practices and recommendations for effective employment of the TPACK model in the setting of Islamic spiritual teaching.

However, in practice, the addition of knowledge in education, especially in the field of Islamic spiritual teaching, is often hindered by the availability of inadequate resources and infrastructure (Gloria & Anugrah, 2021). Schools, especially in remote areas or with limited funding, may not have access to the necessary hardware and software to effectively implement technology-based learning (Hidayah et al., 2020). In addition, unstable or slow internet connectivity can reduce the effectiveness of using knowledge in education. This condition makes it difficult for teachers to integrate technology in the curriculum and present innovative and interactive learning materials, so the potential use of technology in Islamic religious education cannot be fully maximized.

Furthermore, there is often an unavailability of the necessary training to integrate technology in the learning process, leaving some teachers without adequate support (Aniq et al., 2022). This shortcoming suggests that professional training in the utilization of educational technology is still uneven, with some teachers receiving comprehensive training while others do not. As a result, teachers who do not receive adequate training feel less confident and competent in applying technology to support the learning process, especially in Islamic subjects. This creates disparities in the quality of learning offered to students and poses challenges in achieving effective and efficient TPACK integration across educational institutions.

On the other hand, previous research has not specifically identified the barriers and challenges faced by Islamic religion teachers in integrating technology into the curriculum, creating a gap in the academic literature (Wijayanto et al., 2023). While there have been studies on the use of technology in education in general, research focusing on the context of Islamic religious education is limited. This shortcoming points to the need for more targeted research to understand the specificity of the challenges and barriers to technology integration in Islamic religious education. Without an in-depth understanding of this specific context, efforts to formulate effective strategies or solutions to overcome these challenges will be less targeted.

The lack of understanding of how to effectively integrate religious values with the use of technology in learning is a problem in itself. The integration of religious values in technology-based learning requires a deep understanding of how technology can be used to not only deliver content, but also to facilitate learning experiences that enrich the understanding and practice of religious values. Without a clear strategy to combine these two aspects, the use of knowledge in Islamic spiritual teaching may not be fully effective in achieving the desired learning objectives. Therefore, further research is needed to develop and evaluate methods that enable harmonious integration of technology and religious values in the curriculum.

Likewise, there is little empirical evidence indicating the best strategies to overcome these challenges in the context of Islamic religious education. This marks a gap in existing knowledge, where a lack of empirical data makes it difficult to determine the most effective approaches to overcoming barriers to technology integration in religious education. In-depth and focused empirical studies are needed to gather evidence on best practices that can support teachers and educational institutions in effectively integrating technology, especially in teaching Islamic religion.

The position of knowledge addition in Islamic spiritual teaching is becoming increasingly urgent along with the advancement of information and communication technology (Sastradika & Defrianti, 2021). The lack of research that specifically examines the barriers and challenges in integrating the TPACK model in Islamic religious education marks an urgent need for an in-depth study in this area. The gaps in the existing literature, especially related to effective strategies to overcome barriers to technology integration, make this study very important. The findings from this study are expected to provide solutions to the problems educators face in integrating technology in Islamic religious teaching. By deeply understanding the challenges faced and identifying effective coping strategies, this research aims to enrich the knowledge and practice of technology-based Islamic religious education.

Therefore, this study aims to explore the readiness and barriers in the integration of the TPACK model in the Islamic religious education curriculum in senior high schools. Specifically, it seeks to identify the factors that influence the readiness of institutions and teachers in adopting educational technology, as well as the barriers faced in the integration process. In addition, this study aims to formulate strategic recommendations that can support teachers' professional development and the improvement of technology infrastructure in schools. Thus, the results of this study are expected to provide new and practical insights that can be used by schools to improve the effectiveness of teaching Islam through the use of technology. This research also aims to enrich the academic literature with empirical data and in-depth analysis on the application of the TPACK model in the context of Islamic religious education.

Theoretical Framework

Theoretical Framework for Integrating the TPACK Model in Islamic Religious Education will explain how to integrate the Technological Pedagogical and Content Knowledge (TPACK) model with the principles of Islamic

religious education. This framework will guide educators in effectively integrating technology into Islamic religious education, thereby improving teaching and learning.

The TPACK model consists of three interconnected components:

1. Technology Knowledge (TK)
2. Pedagogical Knowledge (CP)
3. Content knowledge (CK)

Integrating TPACK into Islamic Religious Education will take into account:

- TK: Using tools, platforms and digital resources for Islamic education
- PK: Implementing effective teaching methods and strategies in Islamic education
- CK: Understanding Islamic content, values and principles

The framework would likely include:

- Islamic principles and values
- TPACK components
- Pedagogical approaches
- Technology integration
- Learning objectives and outcomes
- Assessment and evaluation

This integration aims to improve the teaching and learning of Islamic religious education, so that it is more interesting, effective and relevant for today's students.

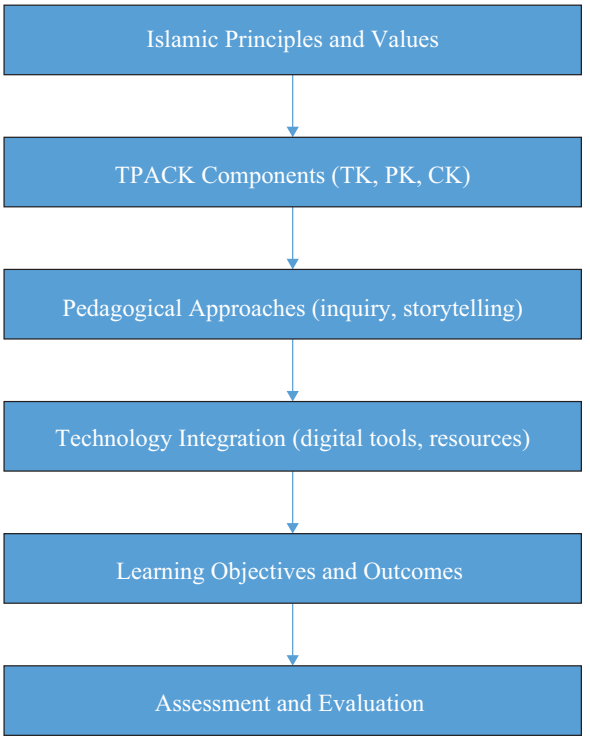

Figure 1 Conceptual Framework

Methodology

Research Design

The research design used in this study is qualitative, with example studies in five universities, i.e., SMA Negeri 12 Pekanbaru, SMA Negeri 2 Pekanbaru, SMA Negeri 7 Pekanbaru, SMA Negeri 13 Peekanbaru and SMA Negeri 14 Peekanbaru. The objective of this research is to analyze technological and pedagogical knowledge and the barriers and organization of content integration (TPACK) model in the Islamic Religious Education curriculum in these schools (Mills, 2019).

Data Collection

Five senior secondary schools were selected as research sites, reflecting geographical diversity, school size, and implementation of educational technology. Site selection criteria were based on variations in the use of educational technology and commitment to teacher professional development in the context of TPACK (Padgett, 2017). The population in this study consisted of principals and teachers in five senior high schools involved in teaching Islamic Religious Education. The selected respondents included 5 principals and 15 teachers, each of whom provided a unique perspective on the implementation and challenges of the TPACK model in their school environment. The instruments used in data collection included in-depth interviews, participatory observation, and document analysis (Berg, 2001). Interviews were conducted both face-to-face and online, depending on respondent availability and preference.

Data Analysis

The interview protocol was designed to explore respondents' perceptions, experiences, and strategies in integrating educational technology based on the TPACK model. Participatory observation was conducted to verify and complement data from interviews, while document analysis included a review of lesson plans, digital learning materials, and school policy documents (Prasojo et al., 2020). The data collection process lasted for three months, followed by qualitative data analysis to identify key themes related to readiness and barriers to the integration of the TPACK model.

Instruments

The instruments used in data analysis included qualitative data analysis software such as NVivo to assist in the organization and coding of data. The analysis technique employed was thematic analysis, where the collected data were broken down into key themes relevant to the study. These themes were then interpreted to uncover significant patterns and relationships concerning the readiness and obstacles in the integration of TPACK. Data triangulation was conducted by comparing results from various data sources to ensure the validity and reliability of the findings.

Results

This study analyzed the readiness to integrate the Technological Pedagogical and Content Knowledge (TPACK) model into the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city. The results of interviews with school principals and observations of technology infrastructure revealed significant variations in technology adoption and teacher readiness. SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru highlighted the importance of institutional support and professional training in overcoming the challenges of technology integration. In contrast, SMA Negeri 7 Pekanbaru and SMA Negeri 13 Pekanbaru emphasized that professional development and teacher collaboration are key to improving teacher and student readiness. Uniquely, SMA Negeri 14 Pekanbaru demonstrated a long-term commitment to educational technology investment using immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR). These findings indicate strategic differences in each school's approach to TPACK integration, underscoring the importance of adaptation and innovation in addressing technological and resource barriers in education.

The study also explored teachers' perceptions and attitudes towards the integration of the TPACK model in the Islamic Religious Education curriculum. Interviews with school principals revealed that teachers generally had positive perceptions of technology integration, with many welcoming the use of technology as a tool to enhance the learning process. The majority of teachers at SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru felt that technology enriched the learning process, although there were concerns regarding technical challenges and the need for further training. On the other hand, teachers at SMA Negeri 14 Pekanbaru were enthusiastic about the potential of technology in learning but were concerned about the time required to prepare technology-based materials. SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, particularly in teaching geography and art, with some teachers emphasizing the importance of training and time for further exploration of technology. Meanwhile, teachers at SMA Negeri 13 Pekanbaru viewed technology integration as an important step towards modern education but had concerns about accessibility and the digital divide among students. Additionally, there were doubts among senior teachers regarding the effectiveness of technology compared to traditional methods in some schools.

In this study, the readiness in integrating the Technological Pedagogical and Content Knowledge (TPACK) model in the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city was analyzed. The following are data from interviews with school principals and observations of technology infrastructure that show variations in technology adoption and teacher readiness (Table 1).

Table 1 shows a comparative overview of technology adoption and teacher readiness across five senior high schools in Pekanbaru. Furthermore, interviews with school principals revealed teachers' perceptions of the integration of technology in the Islamic Religious Education curriculum in senior high schools.

Table 1 Variations in Technology Adoption and Teacher Readiness

No	School Name	Number of Teachers	Technology Used	Readiness
1	SMA Negeri 12 Pekanbaru	78	Microsoft PowerPoint, Canva, Video	Professional Training, Technology Resources
2	SMA Negeri 2 Pekanbaru	66	Edmodo, Google Forms, Padlet	Institutional Support, E-Books, and Digital Materials
3	SMA Negeri 7 Pekanbaru	52	Tinkercad, Scratch, Microsoft Teams	Technology Infrastructure, Professional Training
4	SMA Negeri 13 Pekanbaru	34	Kahoot!, Zoom, Blogs	Teacher Collaboration, Access to Technology
5	SMA Negeri 14 Pekanbaru	66	Google Earth, Virtual Simulation, Adobe Spark	Augmented Reality (AR) and Virtual Reality (VR), Professional Training

Source: Data processed in 2024

For example, in SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru, the majority of teachers felt that technology enriches the learning process. However, there are concerns about technical challenges and the need for further training. Likewise, SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, especially in teaching geography and art, with an emphasis on the importance of training and time for further exploration of technology.

On the other hand, teachers at SMA Negeri 14 Pekanbaru are enthusiastic about the potential of technology in learning but are concerned about the time needed to prepare technology-based materials. While teachers at SMA Negeri 13 Pekanbaru feel that technology integration is an important step towards modern education, there are concerns regarding accessibility and the digital divide among students. Concerns from senior teachers about the effectiveness of technology versus traditional methods are also a concern.

As for the barriers in implementing the TPACK model, this study identified the challenges and mitigation efforts made by the five schools in adopting educational technology as shown in Table 2.

Table 2 shows the main challenges faced by each school and the corresponding strategies implemented to overcome these barriers, thereby supporting the effective integration of the TPACK model in the Islamic Religious Education curriculum. Furthermore, the study also explored the professional development initiatives adopted by the five schools to support the integration of the TPACK model in the Islamic Religious Education curriculum shown in Table 3.

Table 3 summarizes the professional development initiatives implemented by the five senior high schools in Pekanbaru to enhance teachers' competencies and readiness for integrating the TPACK model in Islamic Religious Education. The table highlights training programs, collaborative studies, certification efforts, workshops, and leadership development activities aimed at strengthening both pedagogical and technological skills among teachers.

Discussions

Discussion of the results of this study shows that the integration of the TPACK model in the Islamic Religious Education (PAI) curriculum in schools in Pekanbaru requires special attention to technological readiness and institutional support. Based on the findings, institutional support and professional training are the main keys in overcoming technological challenges. This is in accordance with the opinion of Kristiawan et al. (2022) who emphasized the importance of contextual support in TPACK implementation. SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru emphasized the importance of professional training to ensure teachers are ready to adopt technology in learning. Thus, this study fills the gap of specific research that focuses on the integration of the TPACK model in PAI curriculum by providing empirical evidence on the importance of institutional support and professional training.

Barriers and challenges in technology integration often relate to infrastructure limitations and teacher readiness. The results show that variations in technology adoption and teacher readiness are strongly influenced by institutional and professional support. This opinion is supported by research conducted by Widowati et al. (2020) who emphasized that external factors such as administrative support and adequate infrastructure are

Table 2 Challenges and mitigation efforts

No.	School Name	Barriers	Mitigation Efforts
1	SMA Negeri 12 Pekanbaru	Lack of specific technology training	Organize monthly technology workshops
2	SMA Negeri 2 Pekanbaru	Limited IT infrastructure	Improving IT infrastructure and devices
3	SMA Negeri 7 Pekanbaru	Teacher resistance	Initiate technology sharing and demonstration sessions
4	SMA Negeri 13 Pekanbaru	High cost of new technology	Seeking sponsorship and assistance from alumni
5	SMA Negeri 14 Pekanbaru	Teacher workload and time	Optimizing the use of time and teacher rotation

Source: Data processed in 2024

Table 3 Professional development initiatives

No.	School Name	Professional Development Initiatives
1	SMA Negeri 12 Pekanbaru	Training on technology integration in learning through online and face-to-face workshops
2	SMA Negeri 2 Pekanbaru	Collaborative study in curriculum development using group discussion and literature review methods
3	SMA Negeri 7 Pekanbaru	Professional certification program to strengthen teachers' credibility and professional competence
4	SMA Negeri 14 Pekanbaru	Workshop on creativity and innovation in learning through workshops and simulations
5	SMA Negeri 13 Pekanbaru	Development of educational leadership and classroom management through seminars and leadership training

Source: Data processed in 2024

crucial in overcoming technological barriers. SMA Negeri 7 Pekanbaru and SMA Negeri 13 Pekanbaru emphasize the importance of collaboration among teachers and professional development to improve teacher and student readiness. These findings make a significant contribution in identifying the barriers and challenges faced by PAI teachers in integrating technology.

The best strategies to overcome barriers in the context of Islamic religious education require adaptive and innovative approaches. This research shows that SMA Negeri 14 Pekanbaru has successfully demonstrated a long-term commitment to investment in educational technology, including the use of immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR). This approach is in line with the theory of Allcott et al. (2019) which states that technological innovations can be effectively adopted through a systematic and sustainable approach. Thus, this study fills the lack of empirical evidence on the best strategies to overcome barriers in Islamic religious education by demonstrating the importance of long-term technology investment and innovation.

The integration of religious values with the use of technology in learning is an important aspect that needs attention. The results showed that teachers in SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru generally have a positive perception of technology integration, seeing it as a tool to improve the learning process. This is in line with the opinion of Mukminin & Habibi (2020) who state that technology can be used to support educational values if integrated properly. However, there are concerns regarding technical challenges and the need for further training. This research provides insight into how to integrate religious values with the use of technology in learning, which was previously poorly understood.

This research also shows that technology adoption in schools in Pekanbaru varies depending on the level of acceptance and readiness of teachers. Teachers at SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, especially in teaching geography and art. This is in accordance with the opinion of Gozali & Cahyono (2022) who stated that teachers' readiness and positive attitude are very important in adopting educational technology. However, there are concerns regarding the time needed to prepare technology-based materials. The finding challenges current understanding by showing that despite high acceptance of technology, readiness and time factors remain barriers that need to be overcome.

This research shows the importance of institutional support, professional training and long-term investment in technology to integrate the TPACK model in the Islamic education curriculum. The results also revealed that despite technical challenges and varying readiness among teachers, technology integration in Islamic learning has great potential to improve the quality of education. This opinion is reinforced by research conducted by Chai et al. (2020) which emphasizes the importance of pedagogical technological knowledge in supporting effective learning. Thus, this study not only fills in the gaps of previous specific research but also provides practical guidance to overcome barriers to technology integration in Islamic religious education.

To avoid gaps and problems in the integration of the TPACK model in the Islamic Religious Education curriculum, it is recommended that relevant parties make continuous investments in educational technology, provide adequate professional training and ensure strong institutional support. It is also important to develop adaptive and innovative strategies, such as the use of immersive technologies and collaboration between teachers, to overcome barriers that may arise. If you are already facing these gaps or problems, there is no need to worry because solutions have been found in the results of this study. By following the findings and recommendations, educational institutions can overcome technological challenges and improve teachers' and students' readiness to adopt the TPACK model. This approach will ensure effective technology integration and support religious values in learning.

Conclusion

This study analyzed the readiness to integrate the Technological Pedagogical and Content Knowledge (TPACK) model into the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city. The results revealed significant variations in technology adoption and teacher readiness across the schools. Institutional support and professional training were identified as key factors in overcoming the challenges of technology integration. Additionally, a long-term commitment to educational technology investment, including the use of immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR), demonstrated significant success in some schools. These findings highlight the importance of adaptive and innovative approaches in addressing technological and resource barriers in education.

Theoretically, the findings of this study enrich the literature on the integration of the TPACK model in the Islamic Religious Education curriculum by providing empirical evidence on the importance of institutional support

and professional training. This aligns with previous theories emphasizing the role of technological pedagogical knowledge in supporting effective learning. Practically, these findings offer guidance for educational institutions seeking to enhance teacher and student readiness for technology adoption. By following the recommendations of this study, educational institutions can effectively overcome technological challenges and improve the quality of education. Although this study has limitations, such as the limited sample size of five schools, the results still provide valuable insights that can serve as a foundation for future research. Future studies are recommended to expand the sample size and explore the use of new educational technologies to further enrich student learning experiences.

Furthermore, this research acknowledges that while technology integration shows great potential for enhancing educational quality, significant challenges related to technological readiness and the digital divide among students remain. Therefore, continuous investment in educational technology, adequate professional training, and strong institutional support are crucial. These findings provide practical solutions and advance understanding in the field of Islamic Religious Education, offering directions for future research to further support technology integration in education.

Conflict of Interest

The author declares that there is no conflict of interest.

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