



Strategies for Digital-Based Islamic Education Learning to Enhance Students' Islamic Literacy in the Era of the Industrial Revolution 4.0

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Keywords:

Digital Islamic Education, Islamic Literacy, Industrial Revolution 4.0.

Abstract

The development of digital technology in the era of the Industrial Revolution 4.0 has brought significant changes in various sectors, including in the field of Islamic education. Digitalization in the learning system provides opportunities for students to access Islamic teaching materials in a more flexible and interactive manner, increasing their involvement in understanding Islamic values. However, on the other hand, the adoption of technology in Islamic learning also faces various challenges, such as limited digital infrastructure, low digital literacy among educators, and the validity of Islamic content in online platforms. This study aims to analyze digital-based Islamic education learning strategies to improve students' Islamic literacy in the era of the Industrial Revolution 4.0. This study uses a literature study method with a descriptive qualitative approach, which examines various previous research results related to the use of technology in Islamic education. Data was obtained from scientific journals, academic books, and research reports that discussed the implementation of digital strategies in Islamic education. The results of the study show that digital-based learning can improve students' understanding of Islam through interactive media such as e-learning, learning videos, gamification, and artificial intelligence (AI)-based technology. However, its effectiveness is still influenced by the readiness of educators, access to technology, and regulations in the application of digital-based learning methods. Therefore, a more adaptive and innovative strategy is needed in the development of a digital-based Islamic learning system to ensure success in improving students' Islamic literacy in the digital era.



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INTRODUCTION

Technological developments in the era of the Industrial Revolution 4.0 have had a significant impact on various aspects of life, including in the world of Islamic education. This change requires a transformation in learning methods to remain relevant to the needs of the times. Islamic education not only aims to transfer Islamic knowledge, but also to build character and strengthen Islamic

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literacy among students (Rahman & Nuryana, 2019). With digitalization, technology-based Islamic learning is growing and allows the integration of interactive media, digital platforms, and artificial intelligence in supporting students' understanding of Islamic values (Irawan et al., 2022). Therefore, the implementation of digital learning strategies is one of the solutions that can increase the effectiveness of Islamic education in the modern era.

Islamic education is an educational system that aims to form individuals who are noble, knowledgeable, and have a balance between spiritual and intellectual aspects. Islamic education emphasizes learning based on the values of the Qur'an and Hadith, as well as character development through the approach of tarbiyah (education), ta'dib (moral teaching), and ta'lim (teaching of science) (Octav et al., 2025). In its development, Islamic education has undergone a transformation in line with technological advances and globalization. The integration of modern science and Islamic teachings is the key to forming a competitive generation in the digital era without losing Islamic identity (Sabda, 2025). Therefore, it is important for Islamic educational institutions to continue to adapt curricula and teaching methods that are relevant to the development of the times in order to produce graduates who are not only intellectually intelligent but also strong in moral and spiritual values.

However, Islamic education in the modern era faces various challenges, such as the influence of secularism culture, rapid technological development, and lack of awareness of time management among the younger generation (Asy'ari, 2025). Many students have difficulty balancing religious education and general science, especially with the rise of digital distractions and the unproductive use of technology (Najihah et al., 2025). Therefore, a more innovative approach is needed in the Islamic education system, such as the implementation of digital-based education, interactive learning, and educational models that emphasize the contextualization of Islamic teachings in daily life (Arawan et al., 2025). With this approach, it is hoped that Islamic education can remain relevant and be able to produce a generation that is globally competitive without losing its Islamic roots.

Islamic literacy in the context of the Industrial Revolution 4.0 is not only limited to understanding religious teachings, but also involves students' ability to use technology wisely to access, understand, and disseminate valid Islamic information (Destriani & Warsah, 2022). Currently, many students are more interested in digital content than conventional learning methods, so Islamic education needs to adapt to the times to maintain its relevance (Yusuf et al., 2023). Various online learning platforms, such as mobile-based applications, interactive videos, and gamification in Islamic learning, have been widely used to increase student engagement in the learning process (Mun'im Amaly et al., 2021). However, the effectiveness of the application of technology in Islamic education is still a matter of debate, especially related to the readiness of educators, the availability of digital infrastructure, and the validity of Islamic content presented online (Simbolon et al., 2022).

One of the main challenges in implementing digital learning strategies in Islamic education is the lack of digital literacy among teachers and students, especially in distinguishing between valid and invalid sources of Islamic information (Yahya, 2023). In addition, not all schools have adequate access to digital technology, so the implementation of digital-based learning strategies cannot be applied evenly across Islamic educational institutions (Hajri, 2023). Therefore, it is important to develop a learning model based on a blended learning approach, which combines face-to-face education with digital technology to increase the effectiveness of Islamic literacy in the digital era (Dwiputro, 2022).

In addition to the existing challenges, digitalization in Islamic education also offers various opportunities, especially in improving learning accessibility for students in remote areas who previously had difficulty obtaining quality Islamic education. Digital technology allows students to access Islamic learning materials anytime and anywhere through online platforms. In addition, with

Artificial Intelligence (AI)-based learning methods, students can get a more personalized and adaptive learning experience according to their needs (Huda & Suwahyu, 2024). Therefore, the development of digital-based learning strategies in Islamic education is urgently needed to improve students' Islamic literacy effectively and efficiently.

Without innovative learning strategies, there is a risk that students will access more Islamic information from uncredible sources on the internet, which can lead to a misunderstood understanding of Islamic teachings (Suwahyu, 2024). By designing the right digital-based learning strategy, Islamic education can remain relevant and be able to shape the character of the Muslim generation who have a strong understanding of religion while having good digital literacy.

Several previous studies have discussed the integration of technology in Islamic education. A study conducted by Munandar et al. (2024) found that the use of digital applications in Islamic learning can increase student involvement in understanding Islamic concepts in a more interactive and fun way (Munandar et al., 2024). Another study by Hajri (2023) shows that blended learning in Islamic education can overcome limited access to educational resources in underdeveloped areas (Hajri, 2023). However, these studies still have limitations in discussing concrete strategies that can be applied to improve Islamic literacy through digital technology effectively, so this research will focus on developing more systematic strategies.

This study analyzes digital-based Islamic learning strategies to improve student literacy in the era of the Industrial Revolution 4.0. The focus includes identifying effective models, implementation challenges, and technology optimization solutions. The results are expected to provide recommendations for educators, technology developers, and policymakers to create a more inclusive and effective digital Islamic learning.

METHOD

This study uses a qualitative approach with a library research method, which aims to identify and analyze digital-based Islamic education learning strategies to improve students' Islamic literacy in the era of the Industrial Revolution 4.0. Literature studies allow researchers to collect, analyze, and synthesize various relevant research results in order to obtain a comprehensive understanding of the phenomenon being studied (Creswell & Poth, 2016). This method was chosen because it is appropriate to explore trends, challenges, and innovations in the application of digital technology in Islamic education through the analysis of various academic sources that have been published (Merriam & Tisdell, 2015).

Data Source

The data sources in this study were obtained from secondary literature, which included academic journals, reference books, research reports, conference proceedings, and official documents from educational institutions. The data used included studies on technology-based learning in Islamic education, the effectiveness of digital learning strategies, and the impact of digitalization on students' Islamic literacy (Marshall & Rossman, 2014). The data collected comes from academic publications in the last five years, to ensure the latest and relevant to the context of the Industrial Revolution 4.0 (Silverman, 2024).

Data Collection Techniques

The data collection technique is carried out through the documentation method, namely by searching, collecting, and reviewing various scientific publications related to this research. The data are categorized based on main themes, such as digital-based learning strategies in Islamic education, the effectiveness of the use of technology in improving Islamic literacy, and the challenges of

technology implementation in the Islamic education environment (Bowen, 2009). Source selection is carried out based on academic feasibility, credibility, and relevance to research objectives (Flick, 2020).

Data Analysis Methods

Data analysis in this study was carried out using content analysis and thematic analysis methods. Content analysis is used to examine how digital technology is applied in Islamic education learning strategies and how it affects students' Islamic literacy (Krippendorff, 2018). Meanwhile, thematic analysis was carried out to group the research results into several main categories, such as technology-based learning innovations, the effectiveness of digital learning models, and constraints in the implementation of technology in Islamic education (Huberman, 2017).

To increase the validity of the findings, this study applies source triangulation, namely by comparing various literatures to obtain more accurate information and avoid bias in data interpretation (Denzin & Lincoln, 2011). With this method, this research is expected to make a theoretical and practical contribution to the development of digital-based Islamic learning strategies, as well as provide recommendations for educators, curriculum developers, and policymakers in the field of Islamic education.

RESULT AND DISCUSSION

The following table presents 10 articles selected from various sources that discuss digital-based learning strategies in Islamic education to improve students' Islamic literacy in the era of the Industrial Revolution 4.0. These articles are selected based on relevance, academic contributions, and innovative perspectives in the application of technology in Islamic education. Each article covers different aspects, ranging from the use of digital media, challenges in technology adoption, the effectiveness of digital-based learning methods, to the role of digital literacy in Islamic education.

Table 1. Literature Review

No	Author	Title	Research Focus
1	Noviyanti, Jamilah	The Failure of The Ministry Of Education And Culture (Kemendikbud) To Implement Educational Policies Related To Digital Literacy In The School Literacy	The implementation of digital literacy policies in Islamic education still faces obstacles in effective implementation.
2	Damayanti, Mundir	Implementation of Digital Media in Learning Islamic Religious Education in the Era of Industrial Revolution 4.0	Digitalization in Islamic religious learning has challenges in the digital literacy of teachers and students.
3	Asy'arie, Setiadi, Firdaus	Strengthening Learning Priorities in the 21st Century: Review of Islamic Education Policy in Indonesia	Strengthening digital Islamic education policies can improve students' digital literacy and critical thinking skills.
4	Polupan	Quality management of higher education in the context of digitalization	Digital-based Islamic education requires strong quality management to ensure the quality of learning.

5	Hakim, Siddiqui	The Effectiveness of Leadership Policies in Creating a Digital Library System	Leadership policies have an important role in the implementation of the digital library system to support Islamic learning.
6	Rizqiyah	Implementation of Digital-Based Al-Quran Reading and Writing Training Methods for Children	The digital-based learning method of the Qur'an has proven to be effective in improving children's reading and writing skills.
7	Rulitawati, Sriyanti	Innovating Islamic Education Through Technology: Strategies for Overcoming Challenges in Online Learning	Innovative strategies are needed to overcome challenges in online-based Islamic religious learning.
8	Luqman, Nasution	Digital Based Academic Service Management at SMA N 1 Kutacane, Southeast Aceh Regency	Digital-based academic service management can increase the effectiveness of Islamic education management.
9	Arif, M., & Abd Aziz, M. K. N.	Islamic Religious Education Learning Model in the 21st Century: Systematic Literature Review	The 21st century Islamic Religious Education learning model emphasizes technology integration, competency-based learning, and interactive approaches to improve student understanding.
10	Rifah, R., Jailani, M., & Huda, M.	Artificial Intelligence (AI): An Opportunity and Challenge for Achieving Success in Islamic Education in the Era of Digital Transformation	AI in Islamic education increases the effectiveness of learning but poses challenges to ethics, regulations, and educator readiness.

The results of the research from the ten articles that have been selected show that digitalization in Islamic education has a significant impact on increasing learning effectiveness, although there are still various challenges that must be overcome. Noviyanti and Jamilah (2024) in their research highlight the failure of the Ministry of Education and Culture in implementing policies related to digital literacy in the school environment. This study found that the lack of coordination in policy implementation and limited training for educators caused the adoption of digital literacy in Islamic education to be slow. In addition, they also found that the lack of adequate infrastructure in various regions is the main factor in the inequality of digitization of Islamic education (Noviyanti et al., 2024).

Meanwhile, Damayanti and Mundir (2025) discussed how digital media is applied in Islamic Religious Education (PAI) learning in the era of the Industrial Revolution 4.0. They revealed that the use of digital technology, such as e-learning, cloud-based applications, and interactive platforms, can increase student involvement in understanding Islamic concepts. However, this study also shows that the lack of digital skills of teachers and lack of guidance in utilizing digital technology are the main challenges in the application of this method (Damayanti et al., 2025). These findings are in line with the research of Asy'arie, Setiadi, and Firdaus (2024), which emphasizes the importance of stronger and structured Islamic education policies in the face of the digital era. Their study underscores that critical thinking skills, digital literacy, and student creativity should be the main focus in the development of a digital-based curriculum (Asy'arie et al., 2024).

In the context of digital-based Islamic education quality management, Polupan, (2019) examine digitalization in education quality management in Islamic universities. Their research shows that although digitalization can improve efficiency in academic management, there are still many Islamic universities that face challenges in adapting digital technology thoroughly. This is mainly due to the lack of clear policies and the lack of training for education personnel in managing the digital-based academic system (Polupan, 2019). This study is reinforced by Hakim and Siddiqui (2024), who examine how leadership policies in Islamic educational institutions play a role in creating a more effective digital library system. Their study found that innovative, technology-based leadership can drive the development of better digital-based learning systems (Hakim & Siddiqui, 2024).

Research conducted by Rizqiyah (2024) provides a more specific perspective in digital-based Qur'an learning. This study reveals that Qur'an learning methods that use digital technology, such as interactive applications and gamification methods, have proven to be more effective than conventional methods in improving children's Qur'an reading and writing skills. However, the study also highlights the main challenges in the application of this method, such as the lack of training for teachers and the lack of regulation in the selection of applications that are in accordance with Islamic values (Rizqiyah, 2024). Rulitawati and Sriyanti (2025) also support these findings in their study on technology-based Islamic education innovation strategies. They found that the blended learning model (a combination of online and face-to-face learning) can be the best solution in overcoming challenges in digital-based Islamic learning, especially for institutions that still face technological infrastructure constraints (Rulitawati et al., 2025).

In a study that focuses more on digital-based academic management, Luqman and Nasution (2024) examine how digitalization in academic services in Islamic schools can improve the effectiveness of education management. They found that the implementation of a digital-based academic system can increase transparency, administrative efficiency, and facilitate communication between students, teachers, and parents. However, they also noted that there are still many Islamic schools that do not have an integrated digital-based academic management system, so technology adoption is still running partially and is not optimal (Luqman et al., 2024).

The research conducted by Arif and Abd Aziz (2024) focuses on the learning model of Islamic education in the 21st century. Through a systematic literature review approach, they found that an effective Islamic learning model in the digital era is based on student-centered learning, where students are given greater freedom in exploring learning materials through technology. They also noted that the use of interactive multimedia as well as Artificial Intelligence (AI)-based approaches can help improve students' understanding of Islamic teachings in a more contextual and applicable way (Arif & Abd Aziz, 2023).

Finally, research by Rifah, Jailani, and Huda (2024) discusses how Artificial Intelligence (AI) can be an opportunity as well as a challenge in Islamic education in the era of digital transformation. They found that AI can be used to create personalized learning systems that are tailored to each student's level of understanding and learning needs. However, they also reminded that the use of AI in Islamic education must remain based on Islamic values, as well as have a strict monitoring system to prevent the spread of content that is not in accordance with Islamic principles (Rifah et al., 2024).

Overall, the findings of these various studies show that digital-based learning strategies in Islamic education provide many benefits in improving students' Islamic literacy, especially in terms of accessibility, efficiency, and interactivity in the learning process. However, the studies also highlight key challenges that must be addressed, such as the readiness of educators, digital policy regulation in Islamic education, and the development of a more equitable technological infrastructure. Therefore, more structured efforts are needed in developing an inclusive and sustainable digital-

based learning model, so that Islamic education can remain relevant and be able to produce a generation of Muslims who have strong Islamic literacy in the era of the Industrial Revolution 4.0.

Discossion

Digitalization in Islamic education has become a strategic approach in improving students' Islamic literacy, especially in the era of the Industrial Revolution 4.0 which is marked by rapid technological developments. The integration of technology in Islamic learning not only expands access to knowledge sources, but also allows for more interactive, innovative, and hands-on experience-based methods. However, in its implementation, there are various challenges that need to be overcome and optimization strategies that must be implemented so that digital-based Islamic learning can run effectively.

Effective Digital-Based Islamic Learning Model

Studies show that several digital-based learning models have been proven effective in improving students' Islamic literacy. E-learning-based learning models through platforms such as Learning Management Systems (LMS), Massive Open Online Courses (MOOCs), and Islamic-based mobile applications have provided wide access to quality Islamic materials.

The blended learning approach is also one of the most widely used strategies, combining face-to-face (conventional) methods with technology-based digital learning. In the context of Islamic education, interactive videos, podcasts, and mobile applications based on the Qur'an and Hadith have provided a more flexible learning experience and are tailored to the needs of modern students. Virtual Reality (VR) and Augmented Reality (AR) have also begun to be used to present interactive learning, such as simulations of hajj trips or the history of Islamic civilization.

In addition, the game-based learning approach in Islamic education is growing in popularity, where Islamic-based educational apps and games have helped increase students' interest and understanding of Islamic teachings in a fun and interactive way. Artificial Intelligence (AI) and Islamic chatbots have also begun to be applied to automatically answer student questions related to Islamic topics, thus supporting personalized and individual-based learning.

Challenges in the Implementation of Digital-Based Islamic Learning

Although the digital-based learning model offers various benefits, its implementation still faces a number of challenges. One of the main challenges is the gap in access to technology in some regions, especially in areas with inadequate digital infrastructure. Not all schools have sufficient facilities to support digital learning, both in terms of hardware and internet connectivity.

In addition, the lack of digital literacy among educators and students is also an obstacle in the implementation of this strategy. Many teachers are still used to conventional methods and do not have enough skills in using digital technology to support Islamic learning. This causes a lack of optimization of the use of technology in the teaching and learning process.

Another challenge is Islamic digital content that is still limited and less standardized. Many Islamic learning resources on the internet have not gone through a rigorous academic verification process, so the validity and accuracy of information is an important concern. Filtering content that is not in accordance with Islamic principles also needs to be carried out to ensure that the material used really has educational value and is in accordance with the Islamic faith.

Technology Optimization Strategies in Islamic Learning

To overcome these challenges, several strategies can be implemented so that digital-based Islamic learning is more effective in improving student literacy. Increasing the capacity of teachers in

digital literacy is the main step. Intensive training on the use of LMS, interactive media, and digital methodologies in Islamic education needs to be provided to educators so that they can better integrate technology in teaching.

In addition, the development of Islamic digital content that is more standardized and academic-based is also a priority. Collaboration between educational institutions, scholars, and technologists is needed to create digital learning resources that are credible and easily accessible to students. The government and Islamic educational institutions can also work together in building an integrated Islamic digital platform, which provides various Islamic learning modules with interesting and innovative methods.

Technology infrastructure support is also a key factor. The government and educational institutions need to accelerate the provision of internet access in remote areas, as well as increase the availability of technological devices that can be used for learning. In addition, a simple and adaptive approach to the use of technology must be considered so that digital learning can be used by various groups, including those who have limited access to technology.

Digital security in Islamic learning must also be considered, especially in protecting students from inappropriate content and potential data misuse. The implementation of a strong digital security system and supervision of learning content is very important so that the digital-based Islamic learning ecosystem remains safe and in accordance with sharia principles.

CONCLUSION

The results of this study show that digital-based learning strategies in Islamic education have a significant impact on improving students' Islamic literacy. By utilizing digital technologies such as e-learning platforms, interactive videos, gamification, and artificial intelligence (AI), the learning process can become more engaging and effective. Digital-based Islamic learning allows for wider accessibility, especially for students in remote areas, and provides flexibility in adapting learning methods to individual needs. In addition, the blended learning approach, which combines face-to-face learning methods with digital technology, has proven to be an effective solution in bridging the gap between conventional methods and technology-based learning.

However, the implementation of digital-based learning strategies in Islamic education still faces several challenges. One of the main obstacles is the low level of digital literacy among teachers and students, which hinders the optimal use of technology in the learning process. In addition, the lack of technological infrastructure in some regions, such as limited internet access and limited technological devices, is also an obstacle in the implementation of digitization of Islamic learning. Another challenge is the validity of Islamic content in digital platforms, where the amount of information spread on the internet requires a strict verification system so that students can access reliable learning resources and in accordance with Islamic values.

To overcome these challenges, several strategic steps can be implemented. First, increasing digital literacy for educators and students through technology training and assistance in the use of digital platforms. Second, the development of a structured digital-based curriculum, with the integration of Islamic materials into a technology-based learning system in a more systematic manner. Third, the government and educational institutions need to strengthen digital infrastructure, including increasing internet access and distributing adequate technological devices for Islamic educational institutions. Fourth, the establishment of a credible Islamic digital content curation team, to ensure that the learning resources used are in accordance with academic standards and Islamic values.

Overall, digital transformation in Islamic education has great potential in improving students' Islamic literacy, but its success depends on the readiness of educators, supporting infrastructure, and

clear regulations in the implementation of technology in the Islamic education system. With a systematic and adaptive approach, digital-based Islamic learning can be an effective tool in shaping a generation of Muslims who have a strong understanding of Islamic teachings and have qualified digital skills in the era of the Industrial Revolution 4.0.

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