

Digital-Based Islamic Learning Strategy Management to Enhance Student Literacy

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ABSTRACT

This study aims to analyze the implementation of digital-based Islamic learning strategies in enhancing students' literacy at MIN 3 Metro Lampung. This research employed a qualitative approach with a descriptive case study design based on Creswell's research framework. The study adopted a qualitative descriptive method, with data consisting of both primary and secondary sources. Primary data were collected through observations, interviews, documentation, and literacy assessments involving 16 informants, including the head of the madrasah, the vice principal for curriculum affairs, Islamic Religious Education teachers, information technology operators, and students. The research was conducted from September to December 2025. The findings revealed that digital-based Islamic learning strategies were implemented through three main stages: planning, implementation, and evaluation. The planning stage demonstrated the madrasah's commitment to integrating technology into the learning process; however, several challenges remained, particularly regarding institutional policies, teachers' digital competencies, and infrastructure availability. The implementation of digital learning through Google Classroom, instructional videos, and online learning resources was found to enhance students' engagement, although continuous teacher guidance was still required. The evaluation involving 30 students indicated a 15% improvement in literacy scores, particularly in their abilities to access, comprehend, and utilize digital information. This study highlights that the success of digital-based Islamic learning is not solely determined by technological adoption but also depends on institutional strategies, teachers' pedagogical competencies, and the alignment between technological tools and the characteristics of Islamic Religious Education learning.

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INTRODUCTION

The rapid advancement of information and communication technology over the past few decades has brought about significant transformations in the field of education. Digital education, which utilizes technology to access, manage, and disseminate information, has emerged as one of the solutions for improving the quality of learning worldwide (Cai, Ye, Chen, & Liang, 2024; Singh, Singh, & Mishra, 2024; Timotheou et al., 2023). The digitalization of education provides students with broader opportunities to engage in learning through various electronic resources, including videos, learning applications, and other digital learning materials (Ismail, Shaikh Ali, & Mohd Sharifuddin, 2024; Okoye et al., 2025; Zou, Kuek, Feng, & Cheng, 2025). In the Indonesian context, the implementation of digital technologies in learning continues to encounter various challenges, particularly within Islamic education settings (Zakiyyah, Suparto, Karo-Karo, & Zakir, 2024). Islamic education, which aims to develop students' religious knowledge and moral values, increasingly requires effective digital-based learning strategies to support the achievement of educational goals (Mintasih, Sukiman, & Purnama, 2024; Rahman, Harsing, Alam, Mahmud, & Heryati, 2026).

One of the essential indicators of educational success that cannot be separated from the learning process is students' literacy level. In this context, literacy refers to students' ability to understand, interpret, and utilize information acquired from various sources for their daily live (Li, Zhu, Wu, Yang, & Guo, 2023; Mwiiyale, Hamutumwa, & Shatona, 2025). The need for higher literacy competencies has become increasingly crucial in addressing the growing complexity of global challenges, where students are expected not only to master fundamental knowledge but also to develop critical and creative thinking skills (Hà & Huertas-Abril, 2024; Lubis, Pantiwati, & Rahardjanto, 2025). Therefore, digital literacy, which encompasses students' ability to use technology to access, evaluate, and process information, has become an essential competency in 21st-century learning (Carabregu-Vokshi, Ogruk-Maz, Yildirim, Dedaj, & Zeqiri, 2024; Siddiq, Olofsson, Lindberg, & Tomczyk, 2024). However, despite the continuous growth of educational digitalization, many Islamic educational institutions have not yet fully utilized the potential of technology to develop learning strategies that can optimally enhance students' literacy competencies (Masnawati et al., 2022; Neni, Handayani, & Basori, 2024).

The main issue addressed in this study concerns the suboptimal management of digital-based Islamic learning strategies in enhancing students' literacy. Although many schools and madrasahs have begun integrating technology into teaching and learning processes, they still lack systematic managerial strategies for effectively integrating technology with Islamic education (Haddade, Nur, Achruh, Rasyid, & Ibrahim, 2024; Rohman & Muhtamiroh, 2022). The successful implementation of such strategies largely depends on how Islamic education institutions manage and utilize technology to support effective and efficient learning processes (Almaiah, Al-Khasawneh, & Althunibat, 2020; Alyoussef, 2023). Therefore, this study aims to explore how the management of digital-based Islamic learning strategies can be optimized to improve students' literacy.

Although numerous studies have examined educational digitalization, relatively few studies have specifically investigated the management of digital-based Islamic learning strategies within the context of students' literacy development. Previous research has predominantly focused on the general implementation of technology in education without sufficiently addressing the strategic management aspects required for managing digital-based Islamic learning environments (Boateng et al., 2024; Chugh, Turnbull, Cowling, Vanderburg, & Vanderburg, 2023; Kerimbayev, Adamova, Shadiev, & Altinay, 2025). Furthermore, existing studies have largely overlooked critical managerial factors

involved in effectively integrating technology into the Islamic Religious Education (IRE) curriculum. Consequently, this study seeks to address this research gap by providing an in-depth exploration of how digital-based Islamic learning strategies can be managed and implemented to enhance students' literacy.

The theoretical framework of this study incorporates several key concepts, including educational strategic management theory, which emphasizes the process of designing, implementing, and managing learning strategies to achieve predetermined educational objectives. In addition, digital learning theory, which examines the utilization of technology in learning processes, serves as one of the fundamental theoretical foundations of this study. Digital literacy theory is also employed, particularly in relation to students' abilities to access, understand, evaluate, and process information through digital technologies. Furthermore, the concept of Islamic education is incorporated to examine how Islamic educational principles can be integrated with technological advancement to improve the quality of learning.

The purpose of this study is to analyze how the management of digital-based Islamic learning strategies can be effectively implemented to enhance students' literacy. This research is expected to provide insights into the implementation of digital-based Islamic learning strategies supported by effective educational management practices. Moreover, this study aims to offer practical recommendations for educators and Islamic education managers in developing digital learning strategies that can optimally improve students' literacy. Theoretically, this research contributes to the advancement of knowledge regarding digital-based Islamic educational management and digital literacy development. Practically, the findings of this study can serve as a guideline for schools and madrasahs in designing technology-enhanced learning strategies to effectively strengthen students' literacy competencies.

METHODS

This study employed a qualitative approach using a descriptive case study design based on Creswell's research framework to obtain an in-depth understanding of educational phenomena within their natural contexts. This approach was selected because the study focused on exploring the processes, experiences, and meanings constructed by participants regarding the implementation of digital-based Islamic learning strategies in enhancing students' literacy. The research was conducted from September to December 2025 at MIN 3 Metro Lampung, Indonesia. The research site was purposively selected because the madrasah had integrated digital technologies into the learning process through the use of digital media, online learning resources, and learning platforms. However, the institution continued to encounter challenges related to strategy management, human resource readiness, and the optimization of technology utilization. The phenomena investigated in this study included the planning of digital-based Islamic learning strategies, technology-assisted learning implementation, teacher and student engagement, learning evaluation processes, and changes in students' literacy abilities following the implementation of digital learning strategies.

Data were collected through semi-structured interviews, non-participant observations, documentation analysis, and literacy tests. Semi-structured interviews were conducted to obtain comprehensive information regarding madrasah policies, digital learning planning, teachers' strategies in utilizing technology, students' learning experiences, and supporting and inhibiting factors affecting the implementation of digital-based learning. The interviews involved the head of the madrasah, the

vice principal responsible for curriculum affairs, Islamic Religious Education teachers, information technology operators, and students. Each interview lasted approximately 30–60 minutes. All interview sessions were documented through field notes and audio-recorded after obtaining informed consent from the participants. The recorded interviews were subsequently transcribed for data analysis.

Observations were conducted during eight learning sessions using a non-participant observation technique to examine the implementation of digital-based Islamic Religious Education learning activities. The observation focused on several aspects, including the utilization of technological media, teacher–student interactions, students’ engagement in learning activities, and the availability of supporting facilities. The observation instruments consisted of structured observation sheets and field notes.

Documentation was utilized as supporting data through the analysis of various documents, including learning plans, teaching modules, digital teaching materials, madrasah policy documents, students’ learning products, and learning evaluation documents. In addition, literacy tests were administered to students to obtain supporting evidence regarding changes in literacy abilities before and after the implementation of digital-based Islamic learning.

The research participants consisted of 16 informants selected through purposive sampling based on their direct involvement, experience, and ability to provide relevant information related to the research phenomenon. The informants included one head of the madrasah, one vice principal for curriculum affairs, one Islamic Religious Education teacher, one information technology operator, and twelve students. The students were selected based on variations in their levels of involvement in digital learning activities and their ability to provide reflective accounts of their learning experiences.

Data analysis was conducted through the processes of data reduction, data display, and conclusion drawing. The collected data were filtered, organized, and structured to facilitate further analysis (Supriani, 2025). The emerging findings were presented narratively to describe the research processes and outcomes and were connected with relevant theoretical perspectives (Supriani, Basri, & Suhartini, 2023). The data analysis process was conducted interactively through several stages, including data collection, data condensation, coding, categorization, data presentation, interpretation, and conclusion verification.

Interview, observation, and documentation data were analyzed through systematic coding procedures to identify major themes, including digital strategy planning, learning implementation, students’ literacy development, and supporting and inhibiting factors. The literacy test was administered to 30 students at the beginning and end of the study using instruments consisting of multiple-choice and open-ended questions. The instrument measured five literacy indicators: the ability to access information, understand information, evaluate information sources, relate information to Islamic learning materials, and communicate information effectively.

The literacy test scores were calculated based on the number of correct answers and an analytical rubric for open-ended responses, and the results were converted into a 0–100 scale. The test results indicated a 15% increase in literacy scores, calculated using the percentage increase formula based on the difference between the mean pretest and posttest scores. These quantitative data were positioned as supporting evidence within the qualitative research framework and were used to strengthen the interpretation of findings rather than to examine causal relationships.

The trustworthiness of the data was ensured through source triangulation, technique triangulation, member checking, prolonged engagement and persistent observation, peer debriefing, and audit trails. The validity of the literacy test instrument was examined through expert review, while the consistency of scoring for open-ended responses was maintained through the use of standardized assessment rubrics to ensure reliable score interpretation.

FINDINGS AND DISCUSSION

FINDINGS

Planning of Digital-Based Islamic Learning Strategies

The planning of digital-based Islamic learning strategies at MIN 3 Metro Lampung is carried out as an effort to improve the quality of the learning process while simultaneously supporting the development of students' literacy. Based on the results of interviews with research participants, it was found that the madrasah has demonstrated a relatively strong awareness of the importance of integrating technology into learning activities. However, the planning for its implementation remains at a developmental stage and has not yet been fully designed in a systematic, structured, and sustainable manner.

The utilization of technology has become one of the main concerns in the development of learning practices at the madrasah; nevertheless, its implementation continues to encounter several challenges, particularly related to teachers' digital competencies and the limited availability of supporting facilities and technological infrastructure. This condition was highlighted by the head of the madrasah, who stated: *"We realize that learning today can no longer rely solely on conventional methods. Technology needs to be utilized so that students can gain broader learning experiences. However, in its implementation, we still face several challenges, particularly teachers' abilities to develop digital-based learning and the limited availability of technological devices at the madrasah."*

This statement indicates that the madrasah management has established a vision for developing digital-based learning, although its implementation still requires more systematic and comprehensive planning. A similar condition was explained by the Vice Principal for Curriculum Affairs, who stated that technology integration has begun to be implemented in several subjects through the use of learning platforms and digital media. However, such integration has not yet been specifically accommodated within the planning of Islamic Religious Education (IRE) learning.

This situation occurs due to the uneven readiness of teachers and the need to adjust the use of technology according to the characteristics of the learning materials being taught. As expressed during the interview: *"In several subjects, the use of technology has already started, for example through learning platforms and digital media. However, in Islamic Religious Education, not all teachers have implemented it consistently because they are still adapting it to the learning materials and their respective levels of readiness."*

Based on the documentation analysis of curriculum documents and instructional planning materials, it was found that technology utilization has begun to be incorporated into learning planning. However, there is no specific policy that comprehensively regulates the integration of digital technology into Islamic learning. The utilization of technology still largely depends on the creativity, initiative, and readiness of individual teacher.



Figure 1. Documentation of Digital Learning Devices Used by Islamic Education Teachers

The figure illustrates that digital-based Islamic learning strategies have begun to be incorporated into teachers' instructional planning through the selection of technology-based learning media and resources. However, the absence of standardized digital planning guidelines among teachers has resulted in technology implementation remaining highly individualized and not yet becoming an integral part of the madrasah's overall educational strategy.

At the instructional implementation level, interview findings revealed that Islamic Education teachers encounter several challenges in designing and developing learning materials that align with the characteristics of digital media. Teachers reported that not all Islamic Education content can be easily transformed into digital formats, particularly materials with conceptual characteristics that require in-depth explanation, such as *fiqh* (Islamic jurisprudence). The development of digital learning materials requires not only technical proficiency in utilizing technology but also pedagogical creativity to ensure that the selected media can meaningfully support students' understanding. Teachers emphasized that technology integration in Islamic Education should not merely function as an entertainment tool but should serve as a medium that enables students to understand religious concepts in a more concrete and contextual manner. As one Islamic Education teacher stated: *"Islamic Education materials have different characteristics compared to several other subjects. For certain topics, such as fiqh, teachers need to be more creative in selecting appropriate media so that students do not perceive technology merely as entertainment, but rather as a tool that genuinely helps them understand the concepts."*

Islamic Education teachers further explained that the technological training provided so far has not been specifically directed toward the development of digital-based Islamic Education learning. Although these training programs have helped teachers become familiar with various educational applications and technological tools, they have not sufficiently addressed the development of creative, interactive, and contextual Islamic Education materials in digital formats. This situation has resulted in some teachers still relying on existing digital learning resources and independently adapting them to meet classroom learning needs. As expressed by an Islamic Education teacher during the interview: *"Technology training has indeed helped teachers become familiar with various applications, but it has not extensively discussed how to create engaging Islamic Education materials in digital formats. As a result, teachers still frequently use available materials and adjust them independently according to their classroom learning needs."*

These findings indicate that the planning of digital-based Islamic learning strategies at MIN 3 Metro Lampung has demonstrated a positive direction of development; however, further strengthening is required in terms of policy frameworks, teachers' digital competence development, technological resource provision, and evaluation mechanisms. Digital learning planning needs to be developed as an integrated instructional strategy within the Islamic Education curriculum rather than merely serving as an additional component of the learning process.

Implementation of Digital-Based Islamic Learning Strategies

The implementation of digital-based Islamic learning strategies at MIN 3 Metro Lampung demonstrates an effort to integrate technology into the learning process, although its implementation remains in the developmental stage and has not yet reached its optimal level. Based on observations conducted during eight Islamic Religious Education learning sessions, it was found that several teachers had utilized digital technologies, such as Google Classroom, Zoom, instructional videos, and electronic teaching materials, to support learning activities. However, the use of these technologies was still predominantly limited to delivering learning materials, distributing assignments, and facilitating learning communication. Meanwhile, the utilization of technology as a medium for interactive and collaborative learning remains relatively limited.

Interviews with Islamic Religious Education teachers revealed that the integration of technology into learning activities has been implemented as an adaptation to the demands of education in the digital era, although its application remains limited and uneven among teachers. Teachers have utilized several digital platforms, such as Google Classroom for sharing learning materials and instructional videos to support the explanation of specific topics. However, the use of these technologies remains relatively basic due to differences in teachers' abilities to design and develop interactive digital learning environments. This condition was expressed by one of the Islamic Religious Education teachers: *"We have started using several digital media, such as sharing materials through Google Classroom or using videos to explain certain topics. However, the use of technology is still simple because not all teachers have the same level of ability to create interactive digital learning."*

The Islamic Religious Education teachers further explained that the selection of digital media should be adjusted to the characteristics of the learning materials being taught. The use of videos was considered effective for delivering historical materials or topics requiring visual illustrations, such as Islamic history, because it helps students understand events, figures, and learning contexts in a more concrete manner. However, for materials that require accuracy in understanding religious evidence (*dalil*), concepts, and legal provisions, such as Islamic jurisprudence (*fiqh*), digital media still needs to be complemented by direct teacher explanations to prevent misconceptions or inaccurate interpretations. This was explained by one of the informants: *"For certain topics, such as Islamic history or materials requiring illustrations, the use of videos greatly helps students understand the content. However, for subjects such as fiqh, students still need direct explanations from teachers to avoid misunderstandings."*

These findings indicate that digital learning implementation has not fully replaced face-to-face instruction; rather, it functions as a complementary medium that expands learning resources and supports classroom activities. Observation results showed that when teachers utilized instructional videos or visual media, students appeared to demonstrate greater engagement by actively responding and participating in discussions. Conversely, when technology was used merely for distributing documents or textual materials, student engagement tended to be lower.



Figure 2. The Utilization of Digital Devices as Supporting Media for Learning

The figure above illustrates a digital-based learning activity involving the use of digital screens by teachers and laptops by students. Teachers deliver and explain learning materials through electronic presentation materials, while students access the learning resources using their respective devices while continuing to receive direct guidance and assistance from teachers.

From the students' perspectives, the use of digital media facilitates access to and understanding of learning materials, particularly when the materials are supported by visual examples. However, students still require teacher guidance when dealing with complex concepts. One student stated: *"When videos or digital materials are used, it is easier for me to understand because there are examples that I can see. However, for difficult materials, such as tajwid (Qur'anic recitation rules), it is still easier when the teacher explains them directly."*

Another student explained that the integration of technology in learning provides greater flexibility because learning materials can be accessed and reviewed outside the classroom according to individual needs. Nevertheless, the digital learning experience has not been equally experienced by all students, as it is still influenced by differences in device ownership and internet connectivity. This condition was reflected in the statement of another student: *"Learning through technology allows me to review the materials again at home. However, sometimes some friends experience difficulties because they do not have their own devices or because the internet connection is unstable."*

The observation results also revealed variations in the strategies employed by teachers when integrating technology into learning activities. Some teachers utilized instructional videos as introductory activities (*aperception*), material illustrations, or reinforcement strategies to enhance students' understanding. Meanwhile, other teachers still used technology primarily for distributing learning materials and assignments. These differences in technology utilization patterns have resulted in unequal digital learning experiences among students.

In addition to teachers' digital competencies, the implementation of digital-based Islamic learning also faces challenges related to infrastructure, particularly limited access to digital devices and internet connectivity. Based on interviews with the information technology operator, the unequal availability of digital facilities among students represents one of the factors affecting the effectiveness of digital learning implementation. This condition causes digital-based learning processes to not always operate optimally, especially when all students require simultaneous access to technological resources. As stated by the information technology operator: *"The main challenges that frequently occur are the*

availability of devices and internet networks. Not all students have the same facilities; therefore, when learning activities require simultaneous digital access, several obstacles still emerge."

These findings are further supported by data indicating that some students experienced difficulties in participating in digital learning due to limited device availability or unstable internet connections. Such conditions have prevented some students from fully engaging in learning activities, requiring teachers to provide alternative solutions, such as allowing students to share devices, providing printed learning materials, or offering additional assistance.

Overall, the implementation of digital-based Islamic learning strategies at MIN 3 Metro Lampung demonstrates positive development. Technology has been utilized as a supporting medium for delivering learning materials, providing learning resources, assigning tasks, and increasing students' learning attention. However, its implementation continues to encounter several challenges, including differences in teachers' digital competencies, the absence of standardized guidelines for technology integration in Islamic Religious Education (PAI) learning, limited access to digital devices, and unequal internet connectivity.

Therefore, optimizing digital-based Islamic learning requires continuous professional development programs for teachers, the development of digital learning materials aligned with the characteristics of PAI content, improvement of technological infrastructure, and the formulation of more structured instructional strategies. These efforts are essential to ensure that technology integration can make a more significant contribution to enhancing students' digital literacy and religious understanding.

Evaluation of Digital-Based Islamic Learning Strategies

The evaluation of digital-based Islamic learning strategies at MIN 3 Metro Lampung was conducted to examine the extent to which technology implementation supports the learning process and the development of students' literacy skills. Based on interviews with the head of the madrasah, Islamic Religious Education (IRE) teachers, and the vice principal for curriculum affairs, learning evaluation was not merely focused on students' academic achievement but also encompassed the process of technology utilization, student engagement, teacher readiness, and the sustainability of digital learning strategies within the madrasah. The head of the madrasah emphasized that, *"We do not want technology to be used merely as a supplement to learning. What needs to be considered is whether technology can help students understand learning materials, become more actively engaged in learning, and improve their literacy skills."* This finding indicates that the evaluation of digital learning strategies is oriented toward assessing the extent to which technology contributes meaningfully to the achievement of learning objectives.

The evaluation results based on observations of eight learning sessions revealed that the use of digital media brought changes to students' learning activities. During the learning process, students demonstrated increased participation through discussion activities, digital information searches, expressing opinions, and completing technology-based assignments. However, the observation findings also indicated that the effectiveness of technology integration was still influenced by several factors, including teachers' readiness in selecting appropriate learning media, the availability of technological devices, and students' ability to utilize digital resources appropriately. An Islamic Religious Education teacher stated that, *"After using digital media, we observed that students became more interested in participating in learning activities; however, they still require guidance so that they do not merely search for information but are also able to understand and evaluate the information they obtain."* This finding

highlights that students' digital literacy needs to be continuously developed through systematic teacher guidance and support.

In addition to evaluating the learning process, this study employed a literacy test administered to 30 students as quantitative supporting data to strengthen the qualitative findings. The test was conducted in two stages: before the implementation of digital-based Islamic learning (pretest) and after the implementation of digital learning (posttest). The test instrument consisted of multiple-choice and open-ended questions designed to measure five literacy indicators: the ability to access information, understand digital information, evaluate information sources, relate information to Islamic Religious Education materials, and communicate information effectively. The analysis results showed that the students' average literacy scores increased from 68.00 in the pretest to 78.20 in the posttest. This change represents a 15% increase based on the calculation of the percentage improvement in the average scores. The improvement indicates the development of students' literacy abilities after participating in digital-based Islamic learning activities.

Table 1. Students' Literacy Test Results after the Implementation of Digital-Based Islamic Learning

Measurement Stage	Number of Students	Average Score
Pretest	30 Learners	68,00
Posttest	30 Learners	78,20
Improvement	-	15%

The test results were subsequently compared with findings from interviews and documentation to obtain a more comprehensive understanding of students' literacy development. The PAI teacher explained that, *"Students are now becoming more accustomed to seeking additional information and are no longer solely dependent on textbooks. However, they still require guidance in selecting reliable sources and using information critically."* Documentation of students' work also indicated improvements in the use of digital resources, information presentation, and the ability to connect learning materials with other relevant sources. These findings suggest that changes in students' literacy development occurred through the integration of technology use, teacher guidance, and more diverse learning activities.

Based on the overall evaluation results, the digital-based Islamic learning strategy implemented at MIN 3 Metro Lampung demonstrated a positive contribution to improving learning quality and supporting students' literacy development. Although the test results indicated a 15% increase in literacy scores, the quantitative data were not used as a basis for establishing causal relationships or determining experimental effectiveness. In this study, test results were positioned as supporting data that strengthened the interpretation of the primary findings obtained from interviews, observations, and documentation. Therefore, the increase in literacy scores was interpreted as one of the indicators of changes occurring during the implementation of the digital learning strategy. The evaluation further revealed that the success of digital-based learning is highly dependent on several interconnected factors, including teacher readiness, infrastructure support, madrasah policies, and students' ability to utilize technology critically and responsibly.

DISCUSSION

Digital-Based Islamic Learning Strategy Planning as the Foundation of Pedagogical Transformation

The findings of this study indicate that the planning of digital-based Islamic learning strategies at MIN 3 Metro Lampung has demonstrated an initial direction toward learning transformation; however, it has not yet fully developed into a systematic institutional strategy. This condition suggests that educational digitalization is not merely associated with the provision of technological infrastructure but also requires organizational readiness, curriculum policy alignment, and teachers' pedagogical competencies. From the perspective of digital transformation in education, technology can generate optimal impacts when it is strategically designed through planning that connects learning objectives, students' characteristics, and instructional content requirements (Lee, Chung, & Wei, 2022; Pappas & Giannakos, 2021; Wilson, Ritzhaupt, & Cheng, 2020; Zhang & Li, 2025). Therefore, the findings of this study reinforce the argument that the success of digital learning begins with an institution's capacity to establish a well-directed and sustainable strategic framework.

The limitations identified in digital planning within this study are primarily influenced by the absence of specific institutional policies that integrate technology into Islamic Religious Education (IRE) learning. This condition explains why technology utilization remains largely dependent on individual teachers' initiatives and has not yet evolved into consistent and sustainable instructional practices. These findings support previous studies on digital leadership, which emphasize that school leadership plays a crucial role in fostering innovation culture and ensuring the sustainability of technology transformation (AlAjmi, 2022; Banoğlu, Vanderlinde, Çetin, & Aesaert, 2023; Navaridas-Nalda, Clavel-San Emeterio, Fernández-Ortiz, & Arias-Oliva, 2020). In the context of MIN 3 Metro Lampung, the support provided by the head of the madrasah has become an initial driving factor for digital learning development; however, it needs to be strengthened through internal regulations, structured teacher training programs, and systematic evaluation of technology implementation.

The findings regarding the challenges experienced by Islamic Religious Education teachers in designing digital learning materials indicate that the primary challenge is not merely technical proficiency in operating digital applications but rather the ability to integrate technology with pedagogical approaches and Islamic disciplinary knowledge. This finding aligns with the Technology Pedagogical Content Knowledge (TPACK) framework, which emphasizes that effective technology integration requires a balanced relationship among content knowledge, pedagogical strategies, and technological competence (Aktaş & Özmen, 2020; Petko, Mishra, & Koehler, 2025; Schubatzky et al., 2025). Within Islamic education, the characteristics of learning content, such as fiqh (Islamic jurisprudence), tafsir (Qur'anic interpretation), and akhlaq (Islamic morality), require processes of interpretation, reflection, and dialogue that cannot always be replaced by digital media. Therefore, this study extends the existing TPACK discourse by demonstrating that technology integration in Islamic education should incorporate not only technical and pedagogical dimensions but also the dimensions of values, meanings, and religious understanding.

Implementation of Digital-Based Islamic Learning: Mechanisms of Student Engagement and Literacy Enhancement

The relationship between planning and implementation can be observed through how the designed digital strategies are translated into actual learning activities. The findings indicate that technology has begun to be integrated through platforms such as Google Classroom, instructional videos, and digital learning resources; however, the level of utilization varies among teachers. These variations suggest that successful implementation is not determined solely by the availability of

technology but also by teachers' ability to transform technological tools into meaningful learning experiences. Previous studies have emphasized that effective digital learning requires pedagogical designs that promote interaction, collaboration, and active student engagement rather than merely transferring learning materials from printed formats into digital forms (Heilporn, Lakhal, & Bélisle, 2021; Hernández-Sellés, Muñoz-Carril, & González-Sanmamed, 2020; Sailer, Maier, Berger, Kastorff, & Stegmann, 2024). The findings of this study reinforce this argument within the specific context of Islamic Religious Education.

The implementation of digital learning in this study demonstrates that student engagement increases when technology is utilized as a medium for exploration and interaction, including through the use of instructional videos, information searching activities, and discussions based on digital resources. This mechanism of increased engagement occurs because technology provides access to more diverse learning resources and enables students to construct knowledge more independently. However, this study also reveals that technology use merely as a medium for delivering learning materials is insufficient to generate optimal engagement. This finding is consistent with previous research on student engagement in technology-enhanced learning, which indicates that the quality of learning activities plays a more decisive role than the mere presence of technological tools (Bond, Buntins, Bedenlier, Zawacki-Richter, & Kerres, 2020; Consoli et al., 2025; Godsk & Møller, 2025; Wang et al., 2022).

Within the context of Islamic Religious Education, this study demonstrates that technology functions as an enhancer of learning rather than a replacement for pedagogical interactions between teachers and students. The finding that students continue to require teacher guidance, particularly in learning *fiqh* (Islamic jurisprudence), reflects the distinctive characteristics of Islamic education, which emphasize conceptual understanding, interpretation, and the internalization of values. This characteristic differs from general information-based learning, where content can often be more easily transferred into digital environments. Therefore, this study extends existing perspectives on digital learning, which frequently position technology as the central component of learning, by demonstrating that digital Islamic learning requires a hybrid model that integrates technological flexibility with teacher-guided pedagogical support.

The infrastructure limitations and digital access disparities identified in this study further highlight that digital transformation cannot be separated from issues of educational equity. Some students experienced difficulties accessing learning materials due to limited device availability and unstable internet connectivity. These conditions indicate that digitalization can simultaneously create new educational opportunities and reinforce inequality when it is not supported by policies that consider students' diverse social conditions. This finding aligns with previous research on the digital divide, which explains that the success of educational technology implementation is strongly influenced by access to devices, connectivity quality, and the availability of supportive learning environments (Cullinan, Flannery, Harold, Lyons, & Palcic, 2021; Katz, Jordan, & Ognyanova, 2021; Lebeničnik & Istenič Starčič, 2020). Therefore, the development of digital Islamic learning should incorporate the principle of inclusivity to ensure that technological advancement contributes to equitable educational improvement rather than creating new forms of exclusion.

Evaluation of Digital Strategies and the Meaning of Literacy Enhancement in Islamic Learning

The evaluation of digital-based Islamic learning strategies indicates that learning transformation is reflected not only in the adoption of technology but also in the development of students' literacy capabilities. The assessment results from 30 students demonstrated a 15% increase in literacy scores following the implementation of digital learning. From an educational perspective, this improvement suggests that technology contributes to students' ability to access, comprehend, and utilize information effectively. However, since this study employed a qualitative approach, the percentage increase is not positioned as empirical evidence of experimental effectiveness; rather, it serves as supporting evidence that strengthens findings obtained from interviews and observations. This approach aligns with the principle of mixed evidence interpretation, in which quantitative data within qualitative research can enrich the understanding of complex educational phenomena.

The 15% literacy improvement identified in this study was influenced by several interconnected factors, including the quality of digital learning media, teachers' instructional strategies, the intensity of technology use, students' learning motivation, and support from the madrasah environment. The most significant developments were observed in students' abilities to locate information, comprehend digital sources, and utilize information to complete learning tasks. Nevertheless, students' ability to evaluate the credibility of information still requires further reinforcement through continuous teacher guidance. This finding supports previous studies on digital literacy, which emphasize that digital literacy extends beyond the operational ability to use technological devices; rather, it encompasses critical thinking skills required to select, evaluate, and utilize digital information effectively (Audrin & Audrin, 2022; Nikou & Aavakare, 2021; Smith & Storrs, 2023). Therefore, digital learning should be directed toward fostering students' critical literacy development.

Overall, this study contributes to the academic discourse by demonstrating that the management of digital-based Islamic learning is a continuous process involving three fundamental components: strategic planning, pedagogical implementation, and literacy-oriented evaluation. The findings reinforce the theory of digital transformation in education, which suggests that technology can only generate meaningful impacts when supported by appropriate institutional strategies and pedagogical practices. Within the context of Islamic education, this study provides the perspective that digitalization should not replace traditional educational approaches; instead, it should facilitate the development of an integrative learning model that combines technology, teacher competencies, and Islamic values. The implications of this research may serve as a foundation for other madrasahs in designing digital learning strategies that are more systematic, inclusive, and oriented toward enhancing students' literacy development.

CONCLUSION

This study demonstrates that the implementation of digital-based Islamic learning strategies at MIN 3 Metro Lampung has developed through a process of planning, implementation, and evaluation involving several key aspects, including madrasah management, teacher competence, technology utilization, and student engagement. The main findings reveal that the madrasah has developed an awareness of the importance of integrating technology into Islamic education; however, its implementation remains at a developmental stage due to several influencing factors, including limited digital policies, teacher readiness, availability of technological infrastructure, and internet accessibility. The forms of technology integration identified in this study include the use of digital learning

platforms, instructional videos, electronic learning materials, and online information resources. These technological applications provide students with more flexible learning experiences and enhance their engagement, particularly when technology is utilized as a medium for exploration and interaction rather than merely as a tool for content delivery. Furthermore, the literacy assessment conducted with 30 students indicated an average score improvement of 15%, suggesting the development of students' abilities to access, comprehend, and utilize digital information in Islamic Religious Education learning.

Academically, this study contributes to expanding the understanding of digital-based Islamic learning by highlighting that successful digital transformation is not solely determined by the availability of technology, but rather by the integration of madrasah management strategies, teachers' pedagogical competencies, the characteristics of Islamic Religious Education content, and students' digital literacy activities. The findings reinforce the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes that technology can generate meaningful learning impacts when appropriately integrated with pedagogical approaches and subject content. Moreover, this study provides the perspective that digital-based Islamic learning should not be understood as a process of replacing teacher–student interaction with technology, but rather as an approach that strengthens the teacher's role in facilitating learning experiences that are more contextual, reflective, and information-oriented. Therefore, this research extends previous studies on educational digitalization by demonstrating that, within the context of madrasah education, the management of digital learning requires a balance between technological innovation and the pedagogical values underlying Islamic Religious Education.

This study has several limitations that should be acknowledged. First, the research was conducted in only one madrasah, namely MIN 3 Metro Lampung, which limits the generalizability of the findings to other Islamic educational contexts with different characteristics. Second, the number of participants was limited to 18 informants, and the study was conducted during the period from September to December 2025; therefore, it does not capture the long-term development and sustainability of digital learning implementation. Third, the quantitative data indicating a 15% improvement in digital literacy were used as supporting evidence within a qualitative research design and did not directly measure the impact of digital learning through experimental or longitudinal approaches. Accordingly, future research is recommended to involve a broader range of madrasahs with diverse characteristics, employ mixed-methods or longitudinal designs to examine literacy development more comprehensively, and develop stronger evaluation instruments to assess the influence of digital-based Islamic learning on students' digital literacy, critical thinking abilities, and twenty-first-century skills.

REFERENCES

- Aktaş, İ., & Özmen, H. (2020). Investigating the impact of TPACK development course on pre-service science teachers' performances. *Asia Pacific Education Review*, 21(4), 667–682. <https://doi.org/10.1007/s12564-020-09653-x>
- AlAjmi, M. K. (2022). The impact of digital leadership on teachers' technology integration during the COVID-19 pandemic in Kuwait. *International Journal of Educational Research*, 112, 101928. <https://doi.org/10.1016/j.ijer.2022.101928>
- Almaiah, M. A., Al-Khasawneh, A., & Althunibat, A. (2020). Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. *Education and Information Technologies*, 25(6), 5261–5280. <https://doi.org/10.1007/s10639-020-10219-y>

- Alyoussef, I. Y. (2023). Acceptance of e-learning in higher education: The role of task-technology fit with the information systems success model. *Heliyon*, 9(3). <https://doi.org/10.1016/j.heliyon.2023.e13751>
- Audrin, C., & Audrin, B. (2022). Key factors in digital literacy in learning and education: A systematic literature review using text mining. *Education and Information Technologies*, 27(6), 7395–7419. <https://doi.org/10.1007/s10639-021-10832-5>
- Banoğlu, K., Vanderlinde, R., Çetin, M., & Aesaert, K. (2023). Role of School Principals' Technology Leadership Practices in Building a Learning Organization Culture in Public K-12 Schools. *Journal of School Leadership*, 33(1), 66–91. <https://doi.org/10.1177/10526846221134010>
- Boateng, S. L., Penu, O. K. A., Boateng, R., Budu, J., Marfo, J. S., & Asamoah, P. (2024). Educational technologies and elementary level education – A bibliometric review of scopus indexed journal articles. *Heliyon*, 10(7), e28101. <https://doi.org/10.1016/j.heliyon.2024.e28101>
- Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. *International Journal of Educational Technology in Higher Education*, 17(1), 2. <https://doi.org/10.1186/s41239-019-0176-8>
- Cai, B., Ye, Z., Chen, S., & Liang, X. (2024). Reducing Safety Risks in Construction Tower Crane Operations: A Dynamic Path Planning Model. *Applied Sciences*, 14(22), 10599. <https://doi.org/10.3390/app142210599>
- Carabregu-Vokshi, M., Ogruk-Maz, G., Yildirim, S., Dedaj, B., & Zeqiri, A. (2024). 21st century digital skills of higher education students during Covid-19—Is it possible to enhance digital skills of higher education students through E-Learning? *Education and Information Technologies*, 29(1), 103–137. <https://doi.org/10.1007/s10639-023-12232-3>
- Chugh, R., Turnbull, D., Cowling, M. A., Vanderburg, R., & Vanderburg, M. A. (2023). Implementing educational technology in Higher Education Institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, 28(12), 16403–16429. <https://doi.org/10.1007/s10639-023-11846-x>
- Consoli, T., Schmitz, M.-L., Antonietti, C., Gonon, P., Cattaneo, A., & Petko, D. (2025). Quality of technology integration matters: Positive associations with students' behavioral engagement and digital competencies for learning. *Education and Information Technologies*, 30(6), 7719–7752. <https://doi.org/10.1007/s10639-024-13118-8>
- Cullinan, J., Flannery, D., Harold, J., Lyons, S., & Palcic, D. (2021). The disconnected: COVID-19 and disparities in access to quality broadband for higher education students. *International Journal of Educational Technology in Higher Education*, 18(1), 26. <https://doi.org/10.1186/s41239-021-00262-1>
- Godsk, M., & Møller, K. L. (2025). Engaging students in higher education with educational technology. *Education and Information Technologies*, 30(3), 2941–2976. <https://doi.org/10.1007/s10639-024-12901-x>
- Hà, T. A., & Huertas-Abril, C. A. (2024). Teaching critical reading in higher education: A literature review and pedagogical framework proposal. *Thinking Skills and Creativity*, 53, 101599. <https://doi.org/10.1016/j.tsc.2024.101599>
- Haddade, H., Nur, A., Achruh, A., Rasyid, M. N. A., & Ibrahim, A. (2024). Madrasah management strategies through Madrasah Reform program: An evidence from Indonesia. *International Journal of Educational Management*, 38(5), 1289–1304. <https://doi.org/10.1108/IJEM-05-2023-0236>
- Heilporn, G., Lakhal, S., & Bélisle, M. (2021). An examination of teachers' strategies to foster student engagement in blended learning in higher education. *International Journal of Educational Technology in Higher Education*, 18(1), 25. <https://doi.org/10.1186/s41239-021-00260-3>
- Hernández-Sellés, N., Muñoz-Carril, P.-C., & González-Sanmamed, M. (2020). Interaction in computer supported collaborative learning: An analysis of the implementation phase. *International Journal of Educational Technology in Higher Education*, 17(1), 23. <https://doi.org/10.1186/s41239-020-00202-5>

- Ismail, K., Shaikh Ali, S. H., & Mohd Sharifuddin, S. (2024). Digitalization in Education and its Impacts in Teaching and Learning. In M. F. bin Romlie, S. H. Shaikh Ali, Z. B. Hari, & M. C. Leow (Eds), *Proceedings of the International Conference on Advancing and Redesigning Education 2023* (pp. 36–45). Singapore: Springer Nature. https://doi.org/10.1007/978-981-97-4507-4_4
- Katz, V. S., Jordan, A. B., & Ognyanova, K. (2021). Digital inequality, faculty communication, and remote learning experiences during the COVID-19 pandemic: A survey of U.S. undergraduates. *PLOS ONE*, 16(2), e0246641. <https://doi.org/10.1371/journal.pone.0246641>
- Kerimbayev, N., Adamova, K., Shadiev, R., & Altinay, Z. (2025). Intelligent educational technologies in individual learning: A systematic literature review. *Smart Learning Environments*, 12(1), 1. <https://doi.org/10.1186/s40561-024-00360-3>
- Lebeničnik, M., & Istenič Starčič, A. (2020). Examining the contemporary digital divide of university students with specific reference to students with special educational needs. *British Journal of Educational Technology*, 51(6), 2422–2441. <https://doi.org/10.1111/bjet.12920>
- Lee, H.-Y., Chung, C.-Y., & Wei, G. (2022). Research on Technological Pedagogical and Content Knowledge: A Bibliometric Analysis From 2011 to 2020. *Frontiers in Education*, 7. <https://doi.org/10.3389/educ.2022.765233>
- Li, H., Zhu, S., Wu, D., Yang, H. H., & Guo, Q. (2023). Impact of information literacy, self-directed learning skills, and academic emotions on high school students' online learning engagement: A structural equation modeling analysis. *Education and Information Technologies*, 28(10), 13485–13504. <https://doi.org/10.1007/s10639-023-11760-2>
- Lubis, J. A., Pantiwati, Y., & Rahardjanto, A. (2025). Students' Scientific Literacy in Critical Thinking Skills in Science Learning: A Bibliometric Analysis from the Scopus Database. *Bioscientist : Jurnal Ilmiah Biologi*, 13(2), 1100–1112. <https://doi.org/10.33394/bioscientist.v13i2.15732>
- Masnawati, E., Aliyah, N. D., Yuliasutik, Y., Mardikaningsih, R., Khotimah, A. K., & Yuliah, Y. (2022). Transformation of Islamic Education in the Digital Age: The Role and Challenges of Educational Technology. *Bulletin of Science, Technology and Society*, 1(3), 45–52.
- Mintasih, D., Sukiman, S., & Purnama, S. (2024). Integration of Digital Technology in Islamic Religious Education Learning: A Qualitative Study on Teachers' Competence and Implementation Models in Secondary Schools. *Jurnal Pendidikan Islam*, 13(1), 85–96. <https://doi.org/10.14421/jpi.2024.131.85-96>
- Mwiiyale, J. M., Hamutumwa, N. U., & Shatona, M. N. (2025). Exploring students' views on information literacy skills training in higher education. *The Reference Librarian*, 66(1–2), 30–47. <https://doi.org/10.1080/02763877.2025.2481088>
- Navaridas-Nalda, F., Clavel-San Emeterio, M., Fernández-Ortiz, R., & Arias-Oliva, M. (2020). The strategic influence of school principal leadership in the digital transformation of schools. *Computers in Human Behavior*, 112, 106481. <https://doi.org/10.1016/j.chb.2020.106481>
- Neni, N., Handayani, S., & Basori, B. (2024). Integration Of Technology And Islamic Values In Islamic Religious Education (Pai) Learning Strategies In The Disruption Era. *Edukasi Islami: Jurnal Pendidikan Islam*, 13(03). <https://doi.org/10.30868/ei.v13i03.8784>
- Nikou, S., & Aavakare, M. (2021). An assessment of the interplay between literacy and digital Technology in Higher Education. *Education and Information Technologies*, 26(4), 3893–3915. <https://doi.org/10.1007/s10639-021-10451-0>
- Okoye, K., Campos, E., Das, A., Chakraborty, V., Ghosh, M., Chakrabarti, A., & Hosseini, S. (2025). Impact of digitalized-education upon sustainable education and practice: A systematic review and meta-analysis of literature based on pre-intra-and-post pandemic and rural education development. *Sustainable Futures*, 10, 100851. <https://doi.org/10.1016/j.sftr.2025.100851>
- Pappas, I. O., & Giannakos, M. N. (2021). Rethinking Learning Design in IT Education During a Pandemic. *Frontiers in Education*, 6, 652856. <https://doi.org/10.3389/educ.2021.652856>
- Petko, D., Mishra, P., & Koehler, M. J. (2025). TPACK in context: An updated model. *Computers and Education Open*, 8, 100244. <https://doi.org/10.1016/j.caeo.2025.100244>

- Rahman, A., Harsing, H., Alam, I. P., Mahmud, M., & Heryati, Y. (2026). Effectiveness and Challenges of Digital and Conventional Islamic Religious Education Learning Media: Quantitative Analysis Based on SLR. *Nidhomiyah: Jurnal Manajemen Pendidikan Islam*, 7(1), 105–117. <https://doi.org/10.38073/nidhomiyah.v7i1.3818>
- Rohman, A., & Muhtamiroh, S. (2022). Integrating Schools and Pesantren Model to Enhance The Quality of Indonesian Madrasa in The Globalization Era. *Al-Ulum*, 22(2), 507–526. <https://doi.org/10.30603/au.v22i2.3486>
- Sailer, M., Maier, R., Berger, S., Kastorff, T., & Stegmann, K. (2024). Learning activities in technology-enhanced learning: A systematic review of meta-analyses and second-order meta-analysis in higher education. *Learning and Individual Differences*, 112, 102446. <https://doi.org/10.1016/j.lindif.2024.102446>
- Schubatzky, T., Burde, J.-P., Große-Heilmann, R., Lachner, A., Riese, J., & Weiler, D. (2025). From knowledge to intention: The role of TPACK and self-efficacy in technology integration. *Computers and Education Open*, 8, 100246. <https://doi.org/10.1016/j.caeo.2025.100246>
- Siddiq, F., Olofsson, A. D., Lindberg, J. O., & Tomczyk, L. (2024). Special issue: What will be the new normal? Digital competence and 21st-century skills: critical and emergent issues in education. *Education and Information Technologies*, 29(6), 7697–7705. <https://doi.org/10.1007/s10639-023-12067-y>
- Singh, R., Singh, S. K., & Mishra, N. (2024). Influence of e-learning on the students' of higher education in the digital era: A systematic literature review. *Education and Information Technologies*, 29(15), 20201–20221. <https://doi.org/10.1007/s10639-024-12604-3>
- Smith, E. E., & Storrs, H. (2023). Digital literacies, social media, and undergraduate learning: What do students think they need to know? *International Journal of Educational Technology in Higher Education*, 20(1), 29. <https://doi.org/10.1186/s41239-023-00398-2>
- Supriani, Y. (2025). Strategic Planning of Islamic Education at Muhammadiyah Terpadu Sendang Agung and SD Muhammadiyah Bandar Jaya. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, 10(1), 514–530. <https://doi.org/10.25217/ji.v10i1.6220>
- Supriani, Y., Basri, H., & Suhartini, A. (2023). Leadership Role in the Formation of Students' Morals. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, 4(3), 528–538. <https://doi.org/10.31538/munaddhomah.v4i3.296>
- Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R., ... Ioannou, A. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies*, 28(6), 6695–6726. <https://doi.org/10.1007/s10639-022-11431-8>
- Wang, Y., Cao, Y., Gong, S., Wang, Z., Li, N., & Ai, L. (2022). Interaction and learning engagement in online learning: The mediating roles of online learning self-efficacy and academic emotions. *Learning and Individual Differences*, 94, 102128. <https://doi.org/10.1016/j.lindif.2022.102128>
- Wilson, M. L., Ritzhaupt, A. D., & Cheng, L. (2020). The impact of teacher education courses for technology integration on pre-service teacher knowledge: A meta-analysis study. *Computers & Education*, 156, 103941. <https://doi.org/10.1016/j.compedu.2020.103941>
- Zakiyyah, I., Suparto, S., Karo-Karo, I. A., & Zakir, M. N. A. (2024). Digital Technology and Socio-Dynamic Aspects of Indonesian Islamic Religious Education: A Total Quality Management Perspective. *JURNAL INDO-ISLAMIKA*, 14(2), 328–343. <https://doi.org/10.15408/jii.v14i2.43760>
- Zhang, Y., & Li, C. (2025). Leveraging pedagogical knowledge for effective technology integration in education: A research-based approach. *International Journal of Educational Research*, 130, 102553. <https://doi.org/10.1016/j.ijer.2025.102553>
- Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: Trends, challenges, and innovations in technology integration. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2025.1562391>