

TEACHERS' STRATEGIES FOR ENHANCING LEARNING QUALITY THROUGH DIGITAL TECHNOLOGY INTEGRATION IN MADRASAH IBTIDAIYAH

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ABSTRACT

This study examines teachers' strategies for improving learning quality through digital technology integration in Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo. Using a qualitative case-study design, the research involved five teachers, consisting of two computer teachers and three homeroom teachers directly engaged in digital learning practices in grades IV–VI. Data were collected through repeated classroom observations, in-depth semi-structured interviews, and documentation of learning devices, school archives, and student activities. Data were analyzed interactively through reduction, display, and conclusion drawing, while trustworthiness was maintained through source and technique triangulation. The findings indicate that digital technology integration does not automatically improve learning quality; rather, it becomes meaningful when teachers actively perform pedagogical functions. The most prominent strategies include facilitating students' interaction with digital resources, strengthening peer discussion, providing stimulating questions, monitoring students' thinking processes, mediating classroom dialogue, and conducting continuous evaluation. These strategies suggest context-specific improvements in student engagement, independence, creativity, collaboration, and basic digital literacy. The study's novelty lies in its focus on teachers' pedagogical

orchestration of digital learning in the context of Islamic elementary education, rather than on the effectiveness of digital media alone. The study confirms that digital transformation in Madrasah Ibtidaiyah depends less on the mere presence of devices than on the quality of teachers' pedagogical integration.

Keywords: *Digital Technology Integration, Learning Quality, Madrasah Ibtidaiyah*

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INTRODUCTION

Digital transformation has transformed the landscape of primary education both globally and nationally. At the policy level, the Ministry of Elementary and Secondary Education (Kemendikdasmen) has positioned digital transformation as a strategic agenda through strengthening technology-based curricula, increasing teacher capacity, providing digital infrastructure, and developing digital literacy, coding, and artificial intelligence in primary and secondary education (Kemendikdasmen, 2025; Bali, 2019). In the context of madrasah (Islamic schools), the Ministry of Religious Affairs is also encouraging the acceleration of the digital ecosystem through the Madrasah Digital Learning scheme, which emphasizes reforms in management, teaching, and the quality of educational services (Avia, 2025).

However, the development of digital technology has not automatically improved the quality of learning. Recent findings indicate that technology utilization often remains limited to presentation functions, while its integration into assessment, collaboration, and student thinking development has not been optimal (Alptekin & Taneri, 2025; Musrifah, 2020). A qualitative study in New Zealand primary schools also confirmed that the

success of technology integration is largely determined by teachers' digital competence, institutional support, and their ability to translate digital tools into inclusive and meaningful learning experiences (Niu & Niranjana, 2025). In other words, the key issue is no longer the availability of tools, but rather the quality of the teachers' pedagogical integration.

In digital education literature, teachers are positioned as the primary actors connecting technology, pedagogy, and content. The Technological Pedagogical Content Knowledge (TPACK) framework emphasizes that the use of new technologies becomes effective when teachers are able to integrate technological knowledge with pedagogical strategies and content (Rahman et al., 2019). Similarly, DigCompEdu positions educators' digital competence not only in technical aspects, but also in learning design, assessment, learner empowerment, and facilitating students' digital competence (Redecker, 2017; Bali et al., 2025). A key implication is that the quality of student learning outcomes is strongly influenced by teachers' capacity to orchestrate technology-based learning experiences.

In the context of Islamic elementary schools (*madrasah ibtidaiyah*), this issue becomes increasingly important because students are in the early stages of developing learning habits, basic literacy, and digital literacy. Students need more than just being introduced to devices; they need support to enable them to use them to observe, search for information, discuss, and build understanding. Recent review research shows that digital competence in post-pandemic education is increasingly understood as a combination of cognitive, technical, attitudinal, and problem-solving skills, rather than simply operational skills (Zhao et al., 2025; Rofideh, 2023; Oktavia et al., 2019). Therefore, studies of teacher strategies in Islamic elementary schools need to focus on how technology is used to significantly improve student learning.

Several studies in Indonesia have discussed the use of information and communication technology in learning, blended learning, and the development of interactive media in elementary education (Kholil et al., 2021; Khasanah & Pratiwi, 2018; Syafruddin, 2019). However, most of these studies still focus on media effectiveness, product development, or general descriptions

of digital device use. Studies specifically examining teachers' efforts to transform device use into improved student learning in elementary Islamic schools (*madrasah ibtidaiyah*) are still relatively limited. Yet, such studies are crucial for understanding the dynamics of technology implementation in elementary Islamic educational institutions, which have their own pedagogical and cultural characteristics.

Although various studies have discussed digital media, blended learning, and digital literacy in elementary education, studies specifically examining teachers' pedagogical strategies for transforming digital device use into improved student learning in elementary Islamic schools are still limited. This limitation suggests that the primary challenge of technology integration in *madrasahs* lies not merely in the availability of devices, but rather in teachers' ability to orchestrate active, collaborative, and meaningful learning experiences. Therefore, this study contributes by offering a contextual reading of teachers' strategies for integrating digital technology in elementary Islamic educational institutions.

Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo is an interesting example of the practice of integrating digital technology at the *madrasah ibtidaiyah* level. This *madrasa* has been utilizing digital devices since 2017, especially in classes IV, V and VI. The use of devices such as laptops, smartphones, tablets and iPads in learning is not only for internet access, but to support soft-file based learning, independent study and discussions between students. This model shows a contextual form of technology integration: it does not depend entirely on online connections, but still shifts learning from a teacher-centered to a student-centered pattern. These conditions make this *madrasa* relevant as a case study location to explore the role of teachers in interpreting digital technology as a medium for improving the quality of student learning.

Based on this background, this research aims to analyze teachers' strategies in improving the quality of student learning through the integration of digital technology at *Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo*. In this article, the quality of student learning is understood operationally as increasing activeness, independence, creativity, ability to collaborate, and basic digital

literacy during the learning process. Through this focus, it is hoped that this article will provide conceptual and practical contributions to the development of digital learning in madrasah ibtidaiyah.

Although previous studies have discussed digital media, blended learning, and digital literacy in elementary education, studies specifically examining teachers' pedagogical strategies for transforming digital device use into improved learning quality in Islamic elementary schools remain limited. Preliminary observations at Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo also showed that digital devices had been present in classroom practice, but their use varied in depth and pedagogical purpose across teachers and grade levels. This indicates that the key challenge lies not merely in device availability but in how teachers orchestrate active, collaborative, and meaningful learning experiences. Therefore, this study contributes by offering a contextual account of teachers' strategies for integrating digital technology in an Islamic elementary school setting.

Previous studies in elementary education have largely examined digital media effectiveness, blended learning models, and the development of digital instructional products. While these studies have generated useful insights, they tend to emphasize either technological tools or student outcomes without sufficiently explaining how teachers pedagogically orchestrate digital resources in everyday classroom practice. This limitation is particularly visible in Madrasah Ibtidaiyah, where digital integration occurs within distinctive pedagogical and cultural settings. To address this gap, the present study positions teacher strategy as the main analytical lens and draws on TPACK and DigCompEdu to examine how teachers connect technology, pedagogy, and learning goals in order to shape student engagement, independence, collaboration, creativity, and basic digital literacy. In doing so, the study advances existing knowledge by offering a context-specific account of digital pedagogy in Islamic elementary education.

METHOD

This study employed a qualitative approach with a case-study design. This design was selected because the study aimed to understand in depth how teachers integrate digital technology within the natural context of the madrasah and how such integration is translated into pedagogical practice. Rather than examining causal relationships statistically, the study focused on processes, meanings, and classroom dynamics that emerge during technology-based learning.

The research was conducted at Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo over a three-month period during the even semester of 2026. The site was selected purposively because the madrasah had implemented the use of digital devices, especially in grades IV, V, and VI, and had developed contextual digital learning practices based on soft files and classroom discussion. The main informants were five teachers directly involved in the implementation of digital learning, consisting of three homeroom teachers and two computer teachers. Supporting data were obtained from institutional documents, classroom activities, learning devices, and archived learning materials.

Data were collected through three techniques. First, repeated classroom observations were conducted to examine patterns of teacher–student interaction, the use of personal devices and digital materials, student participation, and the overall rhythm of the learning process. Second, in-depth semi-structured interviews were carried out to explore teachers’ perspectives on the goals, strategies, challenges, and perceived impact of digital technology integration on students’ learning quality. Third, documentation was collected in the form of lesson plans, teaching materials, digital files, classroom archives, and visual records of learning activities. Source triangulation was operationalized by comparing statements from different teachers, while technique triangulation was conducted by cross-checking observational data, interview narratives, and documentary evidence to identify consistent patterns.

The data were analyzed interactively using the Miles and Huberman model through data reduction, data display, and conclusion drawing. In the reduction stage, the researchers selected,

coded, and grouped data based on recurring themes related to teacher strategies and changes in students' learning behavior. Coding was conducted iteratively, meaning that initial categories emerging from observations and interviews were continually refined as new data were reviewed. In the display stage, data were organized into thematic tables and narrative groupings to make patterns more visible. In the final stage, conclusions were drawn by testing the consistency of emerging interpretations across the three data sources. To reduce subjectivity, the researchers discussed coding results collaboratively and checked whether the final themes remained supported by the available evidence.

Ethically, the study was conducted after obtaining formal permission from the madrasah leadership. All participating teachers were informed of the purpose of the study and agreed to be involved voluntarily. Classroom observations were conducted with institutional approval and without disclosing students' personal identities. In reporting the findings, participant anonymity and institutional confidentiality were maintained where necessary.

RESULTS AND DISCUSSION

RESULT

Research findings show that the integration of digital technology at Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo does not take place in the form of full online learning, but rather as contextual digital learning that combines individual devices, soft-file materials, independent exploration and class discussions. This pattern shows that digitalization of learning in madrasah does not always have to be synonymous with the internet or Learning Management System, but can develop through designs that adapt to the readiness of school infrastructure.

In practice, the teacher does not function as a center of knowledge that dominates the class, but rather as a director of the learning process. Digital technology is positioned as a medium that helps students interact directly with learning resources, while teachers manage the rhythm, direction and quality of this interaction. From the total data, seven forms of teacher effort were found that consistently appeared in the learning process.

Table 1.
Teacher Strategies in Integrating Digital Technology and its
Pedagogical Function

No	Pedagogical Function	Teacher Strategy
1.	Encourage students to interact with digital learning resources.	Shift learning from passive reception to device-based independent exploration.
2.	Encourage discussion between students.	Make technology a catalyst for collaboration, not isolated individual activity.
3.	Asking triggering questions from the teacher to students or between students.	Building scaffolding so that students not only read digital material, but also process it critically.
4.	Monitoring student perceptions and thought processes.	Helps teachers understand how students interpret material and identify misconceptions early.
5.	Monitor learning outcomes throughout the process.	Emphasize the importance of formative assessment when students work with digital resources.
6.	Become a mediator in student discussions.	Maintain the quality of interactions so that discussions remain focused, equal, and oriented towards learning goals.
7.	Conduct ongoing evaluations.	Make technology integration a reflective process that is always improved based on student responses and learning outcomes.

Source: Results researcher, 2026

The first strategy, namely encouraging students to interact with digital learning resources, is the starting point for changing learning patterns. Through the devices owned by each student, the teacher opens up space for students to read, study and follow the

material directly. This practice makes students not completely dependent on the teacher's verbal explanations. Learning resources are no longer present solely through lectures, but are accessed via digital media which can be explored more independently.

The second and third strategies relate to the orchestration of learning interactions. After students interact with digital materials, teachers encourage them to discuss with peers and actively ask or answer questions. These two strategies show that digital technology in madrasah is not used to replace social interaction, but instead to expand the space for learning dialogue. Thus, digital devices function as triggers for academic conversation, not as tools for individual information consumption.

The fourth to sixth strategies show the teacher's function as a guardian of students' thinking processes. Teachers do not stop at providing access to digital materials, but monitor how students understand the material, how they process information, and how discussions between students take place. At this point, the teacher plays both mediative and diagnostic roles: mediative because it helps maintain the direction of the interaction, and diagnostic because it identifies the level of understanding and learning obstacles that arise during the process.

The seventh strategy is continuous evaluation. Evaluation in technology-based learning in madrasah is not just a final assessment, but rather a reflective effort to assess the effectiveness of the method, the suitability of the media, and the quality of student participation. This finding is important because it shows that digital technology integration requires a continuous cycle of improvement. Without evaluation, use of the device has the potential to stop at the technical aspects and not develop into meaningful learning.

The fifth grade teacher explained that the use of soft files allows students "*not to wait for the teacher to continue talking, but to immediately read and prepare their own questions*". Observation results show that when the teacher distributes digital material, most students immediately open their files, read the important points, then discuss them with their group friends. These strategies were consistently associated with perceived improvements in student engagement, independence, creativity, collaboration, and basic

digital literacy as observed by teachers and documented in classroom activities.

Table 2.
Indications of Improvement in Student Learning Quality After
Digital Technology Integration

Dimensions of Learning Quality	Empirical Indications in the Classroom	Meaning of Change
Active learning	Students ask more questions, respond and are involved during learning.	Learning participation increases and classes are no longer completely one-way.
Independent learning	Students review soft files and digital sources before or during discussions.	Learning does not completely depend on the teacher's explanation.
Creativity learning	Students' shows a variety of ways of understanding the material and presenting the results of their studies.	Technology provides space for exploration, not just reproduction of answers.
Collaboration	Discussions with friends are an important part of completing learning assignments.	Social learning occurs which supports shared understanding.
Basic digital literacy	Students are accustomed to using digital devices as a learning medium.	Students are not only familiar with the devices, but begin to understand their educational uses.

Source: Results researcher, 2026

Based on the overall data, the findings suggest positive changes in student learning quality, particularly in the dimensions

of engagement, independence, creativity, collaboration, and basic digital literacy. Five dimensions of student learning quality were identified through repeated observations of students' academic behavior during learning, then confirmed through teacher interviews and documentation of classroom activities. Students become more active in asking questions and discussing, more independent in accessing material, more creative in expressing understanding, and more accustomed to using digital devices for learning purposes. Thus, digital technology in this case is not just a presentation tool, but a medium for forming more participatory learning habits.

However, research also shows that the integration of digital technology requires careful management. Reliance on personal devices requires student readiness and consistent teacher assistance. Apart from that, the learning model used in this madrasah still relies on offline digital sources, so it needs further development so that students not only access the material, but also develop higher skills in searching, evaluating and producing digital information.

DISCUSSION

The findings of this study confirm that teacher effort is a key variable in determining the success of digital technology integration in Islamic elementary schools. This finding aligns with research by Tohet et al. (2021) , which shows that technology utilization in elementary schools is often still predominantly focused on presentations and lacks in-depth understanding of collaboration, assessment, and data management. In the case of Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo, teachers did not simply use devices as a presentation medium but developed them into a means of exploring learning resources, academic dialogue, and formative assessment. This is where this study's important contribution lies: technology functions effectively when teachers transform it into a learning architecture that encourages interaction, not just the consumption of material.

From a TPACK perspective, teacher strategies at Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo demonstrate the intersection of technology, pedagogy, and content. Teachers not only know how to use devices but also understand when and how

to use them to enhance student learning. This reinforces research by Najiburrahman et al. (2021) that effective technology integration always requires pedagogical orchestration. In other words, technical competence without appropriate learning design is insufficient to improve student learning quality.

While contextual digital learning models based on soft files have been shown to facilitate a shift toward more participatory learning, they also have limitations. Reliance on personal devices can widen student readiness variations, while the use of offline resources does not fully develop more complex digital information evaluation skills. Therefore, these findings indicate that digital technology integration in Islamic elementary schools is still in a transitional phase: robust enough to support active and independent learning, but not yet fully achieving higher levels of digital knowledge production.

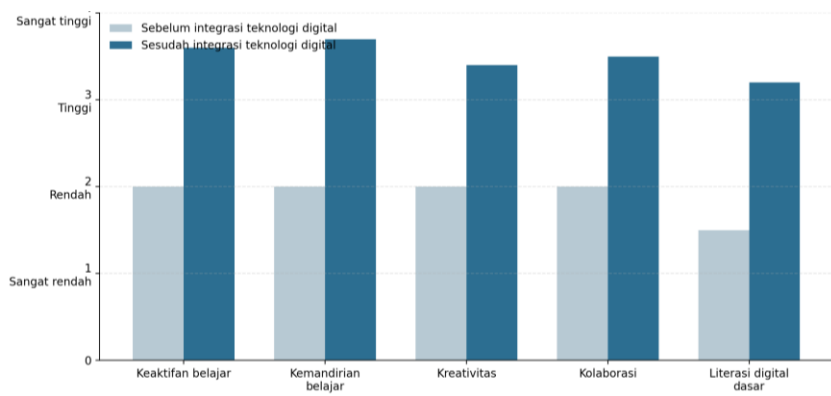


Figure 1.

Qualitative Visualization of Changes in Student Learning Quality After Digital Technology Integration

Source: Researchers' visualization based on qualitative categorization of field data

The findings of this research are also relevant to the DigCompEdu framework which places student empowerment and facilitation of digital competence as important elements of teacher digital competence (Kumalasani & Yunilasari, 2022). In observed practice, teachers not only deliver material, but empower students to explore, read, discuss and interpret the material more

independently. The role of teachers as mediators of discussions and monitors of thought processes shows that educators' digital competence cannot be reduced to operational abilities using devices alone.

While the contextual digital learning model based on soft files has been shown to support more participatory learning, it also has limitations. Reliance on students' personal devices may create variation in readiness and access, while dependence on offline resources does not fully cultivate higher-order digital information evaluation skills. These findings therefore suggest that digital technology integration in this madrasah is still transitional: sufficiently robust to support active and independent learning, yet not fully oriented toward more advanced forms of digital knowledge production. This critical point distinguishes the present study from accounts that treat digitalization as automatically transformative.

More broadly, the results of this research confirm the development of recent literature which places the digital transformation of education on two main axes: increasing teacher competency and providing a supportive institutional ecosystem. Bali & Riandani (2026) emphasized that transformative digital transformation is still often hampered by resource gaps, fragmented training, and issues of equal access. In the context of Madrasah Ibtidaiyah Negeri 1 Paiton Probolinggo, these obstacles are responded to through a digital learning model that is contextual and does not completely depend on the internet. This shows that the integration of digital technology in madrasah can proceed gradually through an approach that is appropriate to local readiness.



Figure 2.

A Digital-Based Learning Environment that Supports Student Independence and Engagement

Source: Researcher documentation, 2026

Furthermore, this article demonstrates that the term "student quality" needs to be understood more specifically as the quality of learning observed in students' academic behavior. This quality is evident in their activeness, independence, creativity, collaboration, and basic digital literacy. This formulation aligns more closely with recent research developments that view the success of digital education not only from test scores, but also from students' academic engagement, study habits, and readiness to participate in the digital ecosystem (Aliyah & Humaidi, 2022). Therefore, this article's contribution goes beyond describing technology use, but also focuses on sharpening indicators of student learning quality in Islamic elementary schools.

At the policy level, these findings are relevant to the direction of national education transformation. The Academic Paper on Coding Learning and Artificial Intelligence emphasizes that digital transformation requires strengthening educator quality, infrastructure access, personalized learning, and equitable distribution of quality education services (Faradina et al., 2023). Therefore, the implementation of digital technology in madrasah

should not only be understood as a program to provide devices, but also as an agenda to strengthen teacher competency in designing active, collaborative, and meaningful learning experiences. The findings of this study confirm that teachers are the cornerstone of the success of this transformation.

For elementary madrasah, the practical implications of this research include at least three things. First, madrasah need to view digital technology as a pedagogical medium, not merely a symbol of institutional modernization. Second, teacher training should be directed at learning design competencies, not just training in application usage. Third, evaluation of technology integration needs to assess changes in the quality of student learning, including participation, independence, and basic digital literacy. Without these three steps, madrasa digitalization risks stopping at the administrative or instrumental level, and failing to produce a true learning transformation.

The findings can be conceptually understood as a pedagogical sequence in which teacher strategies function as mediating mechanisms between digital technology and learning quality. In this sequence, digital devices do not directly improve learning; rather, they become educationally meaningful when teachers organize access, interaction, questioning, monitoring, mediation, and evaluation into a coherent pedagogical process. Through this orchestration, digital pedagogy gives rise to five interrelated dimensions of learning quality: student engagement, independent learning, creativity, collaboration, and basic digital literacy. These dimensions should not be seen as isolated outcomes, but as mutually reinforcing aspects of quality learning in digital environments. Engagement encourages participation, participation supports collaboration, collaboration stimulates creativity, and repeated interaction with digital resources gradually builds digital literacy. Thus, the study suggests a conceptual model in which teacher strategy is the pivotal force that translates digital resources into meaningful learning processes in Madrasah Ibtidaiyah.

While the present findings confirm much of the existing literature on the centrality of teacher competence in digital pedagogy, they also highlight a context-specific difference. International studies often examine digital integration in settings

with broader infrastructure and platform access, whereas this study shows that meaningful digital learning can still emerge in a predominantly offline environment when teachers design active and dialogic learning processes. This indicates that the pedagogical logic of integration may be more decisive than technological sophistication itself. At the same time, the findings also reveal a limitation: offline digital learning may foster participation and independence, but it does not automatically support more advanced competencies such as digital information evaluation or content production. This tension suggests that digital transformation in Madrasah Ibtidaiyah should be understood as developmental and staged rather than fully achieved.

CONCLUSION

This study concludes that digital technology integration in Madrasah Ibtidaiyah becomes educationally effective when teachers actively enact pedagogical strategies that organize access, interaction, questioning, monitoring, mediation, and evaluation into meaningful learning processes. The findings indicate that the quality of student learning in digital environments is reflected not only in academic attainment, but also in student engagement, independence, creativity, collaboration, and basic digital literacy. In this sense, the study extends existing knowledge by showing that digital transformation in Islamic elementary education should be understood less as a matter of device adoption and more as a process of pedagogical integration led by teachers.

Theoretically, the study contributes to the discourse on digital pedagogy by demonstrating that TPACK- and DigCompEdu-oriented teacher practices can be read in a context-specific way within Madrasah Ibtidaiyah. Practically, the findings suggest that educational policy should move beyond device provision toward sustained teacher professional development, curriculum support for digital learning design, and evaluation systems that assess broader dimensions of learning quality. For curriculum developers, the study highlights the need to embed digital pedagogy into everyday classroom routines rather than treating technology as an add-on. For teacher development programs, it emphasizes that pedagogical orchestration—not

technical operation alone—should become the main focus of digital competence training.

This study has several limitations. It was conducted in a single madrasa, relied primarily on teacher perspectives and documentary evidence, and examined learning quality through behavioral indicators rather than direct quantitative measurement. Future research could adopt multi-site and mixed-method designs, involve students and parents more directly, and examine how different institutional ecologies shape the development of digital pedagogy in Islamic elementary education.

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