



Digital Transformation of Learning in Islamic Boarding Schools in The Society 5.0 Era: A Qualitative Study on Enhancing Educators' Digital Competence

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Abstract

The purpose of this study is to describe the digital transformation process of learning at the At-Thahiriyah Kaloran Islamic Boarding School in Serang City as a response to the demands of education in the Society 5.0 era. Digital transformation in Islamic boarding schools is necessary to integrate traditional values with breakthroughs in learning technology. This study uses a qualitative approach and descriptive-analytical methods with field research qualifications. Data obtained through interviews, observations, and documentation are then processed analytically using the Miles and Huberman model of data reduction, data presentation, and conclusion drawing. The results show that the At-Thahiriyah Islamic Boarding School implements digital learning through digital literacy training for students, both internal and external, the provision of internet-based computer laboratories, and the use of social media or websites as learning and promotional media for the institution. However, the digital transformation process also faces obstacles in the form of uneven quality of human resources in managing digital systems and limited costs for maintaining a number of technologies. The conclusion of the study is that the digital transformation of Islamic boarding schools equires improving the digital competence of educators adaptive managerial policies, and strengthening the digital literacy of students so that religious values and the dynamics of the technological era are balanced.

Keywords:

Digital Transformation, Islamic Boarding School Learning, Society 5.0.

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INTRODUCTION

Era Society 5.0 is a paradigm shift in social education from mere digitalization to technological humanization. It posits humanity as an innovation driver supported by artificial intelligence designed to enhance the human life quality. According to Fukuyama (2021), education does not demand technological mastery alone. Still, it also requires reflective and adaptive abilities to navigate social changes. Specifically, educational institutions such as pesantren face a significant challenge in integrating traditional values with innovative learning technology. Munir (2019) defines digital education transformation as a strategic process involving systemic changes in the curriculum, pedagogy, and learning culture. He notes that technology is no longer a supporting instrument but cognitive infrastructure that affects how learners construct knowledge. In line with that, Hidayat and Wibowo (2022) argue that 21st century learning demands digital



literacy, which includes the ability to use and comprehend and critically assess information in digital spaces. The pesantren still faces this challenge given that the traditional islam religious school system emphasizes personal interaction between kiai, (Sutrisno,2020). Meanwhile, international studies indicate that add value-based digital education adoption requires a holistic approach. A British Journal of Educational Technology survey by Kooli claims that digital transformation in faith-based education institutions should preserve cultural authenticity while enhancing learner involvement through adaptive technologies. In another paper in *Education and Information Technologies*, Khan and Qureshi (2022) highlight the significance of a digital literacy strategy in an Islamic educational institution to harmonize spiritual intelligence and technological competence.

This means that the digitalization of Islamic boarding schools is not just a matter of hardware and software, but also a mental and spiritual process inherent in the institution. Furthermore, Arifin emphasized (2021) that the digitalization of Islamic boarding schools must also be linked to strengthening the spirit of digital literacy among students and developing an online learning ecosystem in accordance with Islamic nature. Syahputra added (2022) that the ability of Islamic boarding schools to synergize religious values with innovative technology is a proxime factiva that allows them to continue operating in a digital mode without losing their Islamic identity. All of this means that the digital transition is a process that essentially enriches the inclusive and realistic model of Islamic education in contextual evaluation over time.

Therefore, the urgency of this research lies in the need to understand the extent to which Islamic boarding schools, and specifically the At-Thahiriyah Kaloran Islamic Boarding School in Serang City, are able to effectively implement digital learning transformation. As previous research has shown, most Islamic boarding schools are still in the early stages of digitalization, limited to administration and communication, with minimal translation into the learning itself and the broader curriculum. (Huda & Saepudin, 2021).

Therefore, this study aims: 1. to analyze the process of digital Islamic boarding school learning transformation; 2. to identify the potential and limitations in the process; and 3. to formulate strategic approaches, policies, and resources that enable an effective and sustainable digital learning transformation process. Based on the theoretical foundation and empirical data, the following research hypotheses are stated: H₁: Digital learning transformation improves the quality of the curriculum and the competencies of students in the Society 5.0 era; H₂: Limited digital literacy teachers and technological infrastructure are the main obstacles to digital Islamic boarding school transformation; H₃: Leadership and policies of kiai are conceptualized as moderating factors that influence the balance between technology and the spiritual values of Islamic boarding schools.

Furthermore, this study is expected to generate an in-depth understanding of how digital transformation is practiced in the context of At-Thahiriyah Islamic Boarding School, Kaloran, Serang City, particularly in enhancing educators' digital competence, integrating technology with pesantren learning traditions, and maintaining the core spiritual and moral values amid the demands of Society 5.0. The findings are also anticipated to provide practical recommendations and a

contextual model of digital learning transformation that can be adapted by other Islamic boarding schools facing similar challenges.

METHODS

This study employed a qualitative research approach with a case study design to explore in depth the process of digital learning transformation in Islamic boarding schools within the context of Society 5.0. The case study approach was chosen to capture the complex, contextual, and holistic dynamics of digital transformation as experienced by educators and administrators at At-Thahiriyah Islamic Boarding School, Kaloran, Serang City. This design allows for rich descriptions and interpretations of how digital competence is developed and enacted in a pesantren setting that integrates technological innovation with spiritual and traditional values. Stake (1995) states that a case study is a research strategy that focuses on exploring phenomena within a social system through analyzing multiple data sources to understand the phenomenon as a whole. Quantitative research cannot understand and explain parts or parts. Thus, a qualitative strategy allows researchers to interpret what participants create as part of their definition of the digital transition to improve education that implements its patterns. Different standards also allow us to focus on values, practices, and policies that are derived as important ways in which indigenous Islamic education is embedded (Creswell & Poth, 2018).

The research site was At-Thahiriyah Islamic Boarding School, selected purposively due to its active initiatives in adopting digital learning practices and its strategic role as a modern pesantren in Banten Province. Participants consisted of educators and administrators who were directly involved in planning, implementing, and managing digital learning. The selection criteria included:

1. Educators who actively use digital tools and platforms in teaching and have participated in digital training programs;
2. Administrators and leaders (including kiai and curriculum coordinators) responsible for policy-making and digital transformation strategies;
3. A minimum of two years of experience at the pesantren to ensure familiarity with institutional culture and transformation processes.

Purposive sampling was applied to obtain information-rich participants who could provide deep insights into the phenomenon under study. The location was not chosen randomly but with a purposive method, because it chose an adaptive character to technological innovation while still maintaining tradition on the other hand, Banten Region is an area with the first digitalization development location in Southeast Asia. "The uniqueness of At-Thahiriyah Kaloran Islamic Boarding School fulfills the conditions of rationality." According to Miles, Huberman, and Saldana (2018), the selection of locations in qualitative research should consider the potential for rich information so that researchers are able to gain a complex understanding of the background.

Data were collected using multiple techniques to ensure depth and triangulation:

In-depth Interviews

Semi-structured interviews were conducted with educators, administrators, and the kiai to explore their experiences, perceptions, challenges, and strategies related to digital learning transformation and the enhancement of educators' digital competence.

Classroom Observations

Non-participant observations were carried out during digital-based learning activities to examine how technology was integrated into instructional practices, educator–student interactions, and the learning atmosphere within the pesantren context.

Document Analysis

Relevant institutional documents were analyzed, including curricula, digital learning policies, lesson plans, training modules, and internal reports, to understand the formal framework and consistency between policy and practice.

Data Analysis Procedures, data analysis followed an iterative and inductive process based on thematic analysis using coding procedures:

1. Open Coding: Initial codes were generated from interview transcripts, observation notes, and documents to identify meaningful units of data related to digital transformation and educators' competence.
2. Axial Coding: Codes were then grouped into categories by identifying relationships among them, such as challenges, strategies, leadership roles, and pedagogical changes.
3. Selective Coding: Core themes were refined and integrated to construct a coherent narrative and conceptual understanding of the digital learning transformation model in the pesantren.

The process was conducted continuously alongside data collection to allow constant comparison and refinement of emerging themes.

To ensure the rigor and trustworthiness of the study, the following strategies were employed:

1. Credibility: Achieved through prolonged engagement, triangulation of data sources and methods, and member checking to validate participants' interpretations.
2. Transferability: Provided by offering thick descriptions of the research context, participants, and processes, enabling readers to assess applicability to other pesantren contexts.
3. Dependability: Ensured through an audit trail documenting research procedures, decisions, and analytic processes.
4. Confirmability: Maintained by reflexive journaling and peer debriefing to minimize researcher bias and ensure findings were grounded in the data.

From an ethical perspective, ethical approval was obtained from the relevant institutional authority. All participants were informed about the purpose of the study, voluntary nature of participation, and their right to withdraw at any time. Informed consent was secured prior to data collection, and confidentiality and anonymity were strictly maintained by using pseudonyms and safeguarding all research data.

The research population includes all elements of the Islamic boarding school community involved in learning activities, namely leaders, teachers, staff, and students. The selection of informants used a purposive sampling technique, namely selecting participants who most truly understand the phenomenon being observed this time. Patton 67. The number of informants consisting of 1 Islamic boarding school leader, 4 teachers, 3 senior students, and 2 administrative staff totaled 10 people; the approach was with depth over breadth, where validity is in the form of the depth of data exploration, not the number of respondents. (Creswell & Poth, 2018).

The data sources used in this study consisted of primary and secondary data. Primary data were obtained through in-depth interviews, direct observation, and documentation of digital learning activities at Islamic boarding schools. Secondary data were obtained from literature reviews, policy reports, and internal institutional archives. In qualitative research, the researcher acts as the primary instrument, also known as a human instrument, directly interpreting field data (Sugiyono, 2022). Additionally, interview guides, observation sheets, and audio recorders were used to support data collection accuracy.

Data was collected through three main techniques including (Denzin & Lincoln, 2018):

1. Intensive interview with the informant to have comprehensive information about their experience in utilizing digital learning in pesantren.
2. Participatory observation to see how the device is used, how the teacher is interacting with santri and how the methods are adapted.
3. Documentation study to investigate how the institution policy, curriculum, and digital transformation activities.
4. The combination strengthens the validity of all three methods so that they form a method of triangulation.

Data analysis was performed in an interactive Miles, Huberman, and Saldaña model 2018 involving three primary steps: data reduction, data display, and conclusion drawing. Data reduction involves selecting relevant information, displaying the data in narrative or thematic tables, and drawing conclusions based on the patterns emerging from empirical data. Findings validity is ensured through source and method triangulation, as well as a member check to align the researcher's interpretation with the informant's perspective (Creswell & Poth, 2018; Moleong, 2021). This approach was intended to generate a deep and holistic understanding of the pesantren learning digital transformation process in line with Islamic education research specifics based on value and social context.

Three main methods were used in data collection. In-depth interviews were conducted with key informants to understand their experiences. The interviews were conducted to explore the informants' experiences as learners and educators related to the use of digital technology in teaching and learning at Islamic boarding schools.

Observation, namely participatory observation, was conducted to observe the practice of using digital devices and how they were used in the classroom, teacher-student interactions, and how distance learning (BDR) was adapted to learning methods. Documentation studies, in this case, were used to examine institutional policies, curriculum, and digital transformation activity reports. The presence of

these three methods allows for the use of triangulation for clearer data validation, namely method triangulation (Denzin & Lincoln, 2018).

Miles, Huberman, and Saldaña's (2018) interactive model consists of three main stages: data reduction, data presentation, and conclusion drawing. Data reduction is carried out through selection, presentation, either in narrative form or thematic tables, and conclusions are drawn by observing patterns that tend to emerge based on empirical data. Triangulation of sources and methods, as well as member checking, are used to validate the findings, as researchers construct theories to explain data in educational research. This series of methods is designed with the goal of producing a deep and holistic understanding of the digital transformation process of Islamic boarding school learning, within the context of Islamic socio-cultural research and based on values.

In order to achieve rich and structured data that is in line with the determinate research questions, a semi-structured interview was used as the primary tool for data collection. Creation of the interview questions were grounded in the following digital learning transformation constructs; educators' digital competence, institutional policy and infrastructure readiness as well as the presence and perceived effects of digitization within hindu boarding schools under the Society 5.0 age? This manual enabled flexibility in exploring the participants' experiences and at the same time preserving uniformity between the interview subjects. The Interview guide for the study is shown in Table 1.

Table 1. Research Interview Guide

Digital Transformation of Islamic Boarding School Learning in the Era of Society 5.				
No	Research Focus	Operational Indicators	Interview Questions	Posttest
1	Digital Transformation of Learning	<ul style="list-style-type: none"> - Integration of technological devices in the learning process - Utilization of online media and digital platforms - Adaptation of technology-based learning methods 	<ul style="list-style-type: none"> - How have Islamic boarding schools begun to implement digital tools in their learning activities? - What digital media or platforms are used? - Have teaching methods changed since digitalization? 	Teacher/ Ustaz
2	Teacher Digital Competence	<ul style="list-style-type: none"> - Technical skills in using digital devices - Ability to design technology-based teaching materials - Attitudes toward the use of technology in teaching 	<ul style="list-style-type: none"> - How comfortable are teachers with using technology in teaching? - Do teachers receive specific training related to digital learning? - How do teachers view the benefits and challenges of using technology? 	Teacher/ Ustaz
3	Digital Competence of Islamic Scholar	<ul style="list-style-type: none"> - Skills in using learning applications - Attitudes toward digital learning - Participation in online activities 	<ul style="list-style-type: none"> - How do students experience using digital media in their learning? - Do students find digital learning more engaging or difficult? - To what extent are students actively engaged in online learning? 	Islamic Scholar
4	Institutional Policy and Leadership	<ul style="list-style-type: none"> - Islamic boarding school policies on technology use 	<ul style="list-style-type: none"> - Are there formal policies governing the use of technology in Islamic boarding schools? 	Islamic Boardin g School

		- Managerial support for digital innovation	- How supportive is the leadership in providing digital facilities?	Leader / Manager
		- The role of kiai/leaders in promoting digitalization	- What are the main considerations for Islamic boarding schools in implementing digital transformation?	
5	Infrastructure and Technical Support	- Availability of digital infrastructure	- What is the condition of the technology infrastructure at the Islamic boarding school?	Administrative Staff / Teacher
		- Internet connection and laboratory facilities	- Is technical support available for teachers and students when they encounter difficulties?	
		- Technical assistance for teachers and students	- To what extent do digital facilities support teaching and learning activities?	
6	Barriers and Solutions to Digital Transformation	- Human resource and budget limitations	- What are the main obstacles to the digitalization of learning?	All informants
		- Organizational culture readiness	- How are Islamic boarding schools overcoming these obstacles?	
		- Strategies to overcome digitalization obstacles	- What support is needed to facilitate digital transformation?	
7	The Impact of Digital Transformation	- Increased learning effectiveness	- What impacts have been felt after implementing digital learning?	All informants
		- Changes in teacher-student interaction patterns	- How has the relationship between teachers and students changed?	
		- Impact on Islamic values	- Are Islamic values maintained in digital learning?	

RESULTS & DISCUSSION

Digital Learning Transformation Process in Islamic Boarding Schools

Deep interviews with religious leaders (kyai), administrator and teacher in Islamic Boarding School of At Thahiriyah show that the digital shift of learning in this school is gradual. The leaders support the use of technology to provided in the Era of Society 5.0 without leaving aside the values and traditions within Islamic boarding schools. teachers have started incorporating digital media like WhatsApp, google classroom, you tube and LCDs into their curriculum the instruction has shifted from face to face learning to a blend of both. Teachers' digital capabilities are still varied, thus in-house training, self-study and cooperation in implementing teaching are being pursued. Primary resistance, according to him, comes on the back of poor ease of access depending on the existing devices and internetresources available but generally speaking, this shift is seen as one which has made learning more exciting and educators more innovative.

Below we will highlight this alignment regarding data analysis methods. In the open coding phase, themes were discovered such as religious leaders (kyai) role, digital media usage, teachers' training and internet constraints in preserving Islamic boarding school values. These key words were further analysed at the axial coding stage to be clustered into themes, including leadership, digital learning practices, teacher capability development and infrastructure constraints. In addition, through selective coding all themes were synthesized into one core idea that the digital learning transformation in At-Thahiriyah is an emergent process backed by leadership and aimed at enhancing educators' digital

competence without compromising Islamic values. From early 2023, the School has begun phasing in the digitalisation of learning. The steps of the transformation process include: 1) establishment of computer hardware, projectors, Wi-Fi networks for the computers, 2) training teachers and santri digital literacy skills, as well 3) application of media-based learning included Google Classroom, Canva for Education, and Qur'an Learning App. All three points are a systemic reference to take the traditional model of learning and go towards with structure and continuous to the oasis technology. In a graph, that would look like a teacher's use of digital media experimentally jumping from 25 percent in early 2023 to about 78 percent the following year. Which is to say that, implementation has increased threefold – a big jump in technology adoption.

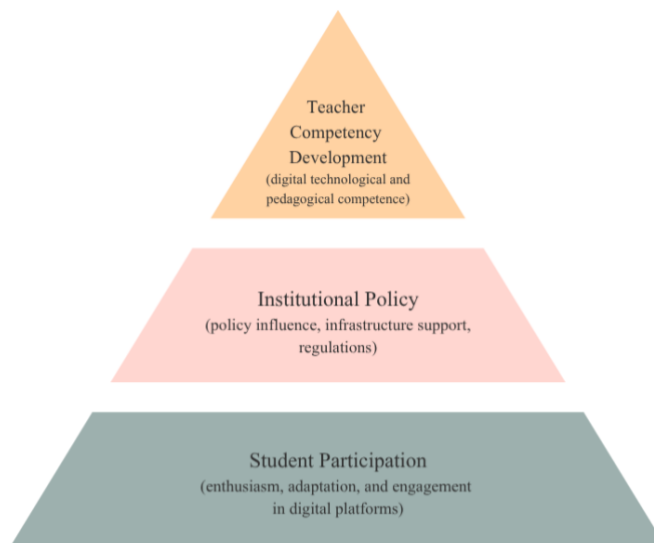


Figure 1. Hierarchy of Islamic Boarding School Digital Transformation Activities

The activity hierarchy graph Figure 1 shows how institution policy, teacher competence development, and santri participation relate to each other as a system of amplification.

These results can be correlated with Basri, Huda, and Zain's 2023 statement that the success of digital transformations in Islamic education institutions depends on the ability to integrate the policy dimension with human resources and infrastructural capacities. At the same time, the research reinforces Davis's 1989 Technological Adoption Model theoretical framework by stating that the technology's perceived usefulness and ease of use is a determinant in altering user behavior. Thus, the changes in the pesantren are not instant but are part of a systematically-designed adaptive process that is contextual.

The first step, determined by the Islamic boarding school, was hardware procurement, which serves as the primary foundation for the digitalization of education. A technology needs audit, encompassing computer hardware, network capacity, and digital space, was conducted. Meanwhile, equipment procurement was carried out in stages, tailored to the institution's budget. The hardware specifications, including a laptop with an Intel i5 processor and a minimum of 8 GB of RAM, and a 3,000 ANSI lumen projector, demonstrated its capabilities in various room conditions. According to Rahman and Santoso, infrastructure readiness emerged as a key determinant of the success of educational digitalization, directly related to the comfort and consistency of online learning. The Islamic boarding school also established an internal technical team to manage device operations and network connections. This action not only accelerated operational fluctuations but also encouraged research and fostered a sense of ownership in digital

facilities. According to Nugraha, Rofiq, and Sari, student involvement in research demonstrates that digital management will achieve a collaborative culture and increase awareness of learning infrastructure. Therefore, hardware procurement is not the end, but rather the beginning of developing a digital culture that involves all aspects of the Islamic boarding school. The second stage is digital literacy training for teachers and students, which provides knowledge of digital transformation. Workshops and mentoring were conducted to develop knowledge about educational software, digital teaching materials, online learning platforms, and digital ethics. According to Redecker, digital competence represents the technical, pedagogical, and ethical capabilities of educators.

Meanwhile, at the Islamic boarding school (*pesantren*) level, training results demonstrated a shift in teacher attitudes, from initially being passive in creating interactive activities based on digital media to being more proactive. For example, students began participating not only in online discussion forums but also in project-based assignments. Empirically, this conclusion was supported by Hasan, Taufiq, and Elmhemit; the researchers observed that facilitated, hands-on training was more effective in improving digital pedagogical skills than a theory-based approach. Furthermore, over 78% of the findings were consistent with the successful implementation of a training approach involving Islamic boarding school teachers through experience. Third, the implementation of digital media-based learning occurred, along with an integration of infrastructure accessibility and user capabilities. Islamic boarding schools utilized various platforms, from Google Classroom for assignment management and Canva for Education for creating interactive visual materials to the Quran Learning App for memorization and recitation. Digital-based media not only increases efficiency but also opens up spaces for spiritual reflection. However, the transformation also brings administrative efficiency, with teachers able to archive information, provide direct feedback, and monitor student progress in real time. According to Arifin, a Learning Management System can save 30% on total administration. This effect confirms that digitalization takes into account not only technological aspects but also managerial efficiency.

These three stages form a continuous cycle: infrastructure creates technical readiness, training builds human readiness, and implementation produces meaningful pedagogical transformation. The synergy of these three can only be similar to the Education 5.0 paradigm; Innovation embraces the integration of pioneering technology, humanity, and spiritual values in Education 5.0, the humanistic education era. Therefore, the ecological "scientific" synergy of these three, along with the modern education fever of 2023, is class 5C. Atthahiriyah Kaloran Islamic Boarding School has successfully proven itself as a traditional Islamic educational institution capable of becoming a digital pioneer and a religious or values-based transformation embedded with existing technology.

Opportunities and Barriers to Digital Transformation

To understand the dynamics of digital learning transformation at the At-Thahiriyah Kaloran Islamic Boarding School in Serang City, this study not only identifies ongoing practices but also explores the opportunities and obstacles encountered in the process. Based on in-depth interviews, observations, and document analysis, it was found that digital transformation opens up opportunities for improving educators' digital competencies and learning innovation, but at the same time also presents structural, cultural, and technical challenges. A summary of these opportunities and obstacles to digital learning transformation is presented in Table 2 below.

Table 2. Opportunities and Barriers to Digital Learning Transformation at At-Thahiriyah Islamic Boarding School.

No	Aspect	Opportunities	Barriers
1	Leadership & Policy	Support from <i>kiai</i> and leaders who provide legitimacy for the use of technology in Islamic value-based learning.	The policy has not been formally written and is still flexible so that implementation is not yet uniform.
2	Educator Digital Competence	High motivation of educators to learn, the existence of internal training and a culture of sharing between teachers.	The digital skills gap among educators; some are still limited to basic technology use.
3	Instructional Model	Opportunities for implementing blended learning that combines face-to-face religious studies with digital resources.	Adaptation of methods is not yet widespread; some educators are still comfortable with conventional methods.
4	Technology Infrastructure	Availability of internet, LCD, and several digital learning support devices.	Limited bandwidth, number of devices, and internet network stability.
5	Culture & Values of Islamic Boarding Schools (<i>Pesantren</i>)	The fear of technology disrupting the discipline and routine of student worship.	Characteristics of <i>Santri</i>
6	Characteristics of Santri	Students are quite familiar with gadgets so they quickly adapt to digital media.	Potential for distraction and misuse of devices for non-academic purposes.
7	Learning Impact	Learning is more interesting, access to materials is wider, and educator creativity is increased.	Dependence on technology; if it is problematic, the learning process is disrupted.

The transformation of digital learning at At-Thahiriyah Islamic Boarding School shows significant opportunities from the support of *kiai* and leaders who legitimize technology in the context of Islamic values, as quoted by Widodo (2025) that "Digitalization can increase the effectiveness of learning if implemented with the right strategy, such as a blended learning approach, digital literacy training for teachers and students, and balanced regulations between the use of technology and Islamic boarding school traditions." High teacher motivation supported by internal training and the availability of basic infrastructure such as the internet and LCD further strengthens this potential, where students who are familiar with gadgets are able to adapt quickly, making learning more interesting with access to broad materials and increased educator creativity, in line with Pratama's statement (2025) that "One of the main challenges in integrating digital technology into the Islamic boarding school curriculum is the infrastructure gap.

Many Islamic boarding schools located in rural areas still lack stable internet access, adequate computers, and other digital devices," although this actually highlights opportunities for adaptation. However, crucial obstacles such as unwritten policies, teachers' digital competency gaps, and infrastructure instability are major challenges, as Saini (2024) states, "Not all Islamic boarding schools have adequate access to digital infrastructure such as fast internet and modern technological devices... Islamic boarding schools also face dilemmas in guiding students in using digital technology, especially the internet," coupled with cultural concerns about disrupting religious discipline and misuse of gadgets. EUDL (2024) adds that "Implementing e-learning in Islamic boarding schools offers a range of significant benefits that support more modern and inclusive learning practices. By enabling students to access learning materials anytime and anywhere, e-learning effectively breaks the limitations of space and time," emphasizing the need for

balance to overcome technological dependency, while Yazmi (2025) asserts, "Digital technology can make a real contribution to improving learning effectiveness" by acknowledging infrastructure challenges.

Digitalization Strengthening and Sustainability Strategy

To make sure that the digital revolution of learning at the At-Thahiriyah Kaloran Islamic Boarding School in Serang City does not only happen at the moment of adaptation, this study also finds various strategies to reinforce and sustain digitalization. These strategies were generated with reference to findings from in-depth interviews, observations and document analysis investment of organisational resources, leadership as well as improving digital competencies amongst educators involvement in education, infrastructure support and upholding Islamic boarding school values. These approaches to boosting digitalization and maintaining digitalization are summarized in Table 3.

Table 3. Strategy for Strengthening Digitalization and Sustaining Digital Learning Transformation

No	Strategic Aspects	Strengthening Strategy	Direction of Sustainability
1	Leadership & Policy	Strengthening the commitment of religious leaders and religious leaders to support digitalization; developing technology use policies that align with Islamic values.	Digitalization is part of the institution's long-term vision and governance.
2	Educator Digital Competence	Regular training, peer mentoring, and communities of practice to share digital learning innovations.	A culture of continuous learning is formed and digital competency of educators is consistently improved.
3	Instructional Model	Develop blended learning and a variety of digital media-based methods.	Digital learning practices are permanently integrated into the curriculum.
4	Infrastructure and Technical Support	Provision of stable internet, learning tools, and simple technical assistance.	Digital systems and facilities are maintained and can be used sustainably.
5	Culture & Values of Islamic Boarding Schools	Developing rules and supervision of gadget use to support the morals and worship of students.	Digitalization goes hand in hand with preserving the identity and values of Islamic boarding schools.
6	Collaboration and Networking	Building collaboration with external parties (campuses, communities, or training institutions) to strengthen digital capacity.	External support expands resources and innovation in a sustainable manner.
7	Monitoring & Evaluation	Regular evaluation of digital learning practices and educator competencies.	Continuous improvement based on data and feedback from school residents.

The strategy illustrated in the table demonstrates that sustainable digital transformation in Islamic boarding schools is only possible from a leadership perspective with a long-term vision. Digitalization is part of the institution's vision and governance, not simply a technical project. This finding aligns with literature findings that visionary leadership in Islamic boarding schools is central to guiding the ethics of technological innovation and its Islamic values (Faizin, 2024; Ulfah, 2022). Therefore, the commitment of the kiai (Islamic scholars) and leaders to implement policies to achieve their vision using technology in accordance with Islam is the primary foundation for the sustainability of digital programs.

From the educator perspective, the table emphasizes strengthening digital competencies through regular training, mentoring, and communities of practice. This

formulation emphasizes the importance of teachers not only as technologically skilled individuals but also as a professional learning ecosystem that enables the sharing of digital learning innovations. This is consistent with the findings that advanced training, in conjunction with the teacher community, plays a significant role in the quality of ICT-based teaching in Islamic institutions (Mainudin, 2023; Supriandi, 2024). In this regard, this analysis reinforces that digital competency is not the result of short-term training but must be integrated as a comprehensive approach. Aspects of the learning model include prioritizing blended learning and various digital media, which occurs when a paradigm shift occurs from face-to-face learning to digital classrooms. The integrity of all media used is also supported by opinions from the results evaluating experiences or contextual examples that blended learning can stimulate and enhance student motivation and its specificity can be maintained through personalized digitalization (Yunita & Mulyadi, 2023; Nugroho, 2024). This means not specifically changing traditions but orchestrating classical traditions with modern technology.

Meanwhile, the infrastructure and technical support points indicate that the success of the strategies outlined above is highly dependent on stable internet availability and easily accessible tools and technical assistance. In many studies, the main obstacle to implementing e-learning in Islamic boarding schools is not value resistance, but rather network weaknesses and minimal technical support (Nugroho, 2024; Zainuddin, 2025), as illustrated in Table 3. This means that there is a clear alignment between the recommendations of the fieldwork and the research points: without significant investment in infrastructure and simple services, digital learning practices will be limited to short trials and, ultimately, will not be integrated into the curriculum.

From an analysis of several aspects of Islamic boarding school culture, values, collaboration, monitoring, and evaluation, it appears that efforts to maintain a balance between utilization and the unique character of Islamic boarding schools are being undertaken. Device management to support morals and worship, collaboration with campuses or communities to build strong digital capacity, and routine, data-driven evaluations clearly demonstrate that digitalization is driven more toward strengthening learning organizations than threatening traditions. The emphasis on "continuous improvement based on data and feedback" demonstrates enthusiasm for implementing various top recommendations from the study's evaluation, including that decisions on digital program development in Islamic institutions must always be accompanied by empirical evidence, so that the transformation that occurs is more adaptive, measurable, and sustainable (Zainuddin, 2025)

In general, the table illustrates that the strategy for strengthening digitalization in Islamic boarding schools is built as a series of interconnected elements, including leadership, educator competency, learning models, infrastructure, and institutional culture. Leadership embraces digitalization as part of a long-term vision, influencing the creation of Islamic technology policies, while improving teachers' digital competency and implementing blended learning ensures that technology is truly integrated into learning practices, rather than simply a symbol of modernization. This pattern aligns with recent research findings, which suggest that successful digital transformation in Islamic education involves a harmonious alignment between leadership vision, educator capacity building, curriculum innovation, and supportive infrastructure (Helena, 2024; Istibana, 2025).

On the other hand, the cultural, collaboration, and monitoring and evaluation sectors in the table demonstrate concern that digitalization must maintain the identity of Islamic boarding schools so they cannot adapt to change. Rules for device use to strengthen worship and morals, classroom collaboration with campuses or communities, and data-related evaluation form a cycle of improvement that makes Islamic boarding schools learning organizations in this digital era. This is in line with the findings that when these

institutions integrate technology through quality assurance, external partnerships, and structured evaluation, the quality of education is significantly improved, services and administrative efficiency, and the character of Islamic boarding schools is not diminished, but enhanced (Ibrahim et al., 2024; Muzakky et al., 2023).

Another self-strengthening strategy will include improving digital infrastructure. Improving internet network quality, providing hardware such as computers or tablets, and developing digital laboratories are all necessary to ensure the smooth running of online and blended learning processes. Adequate infrastructure not only facilitates access to materials but can also encourage teachers and students to be more actively involved in using technology as a learning and teaching tools (Al-Emran et al, 2020).

Meanwhile, the creation and management of contextual and interactive digital content can also be a strategy. Learning that aligns with the Islamic boarding school curriculum, is engaging, and easily accessible to students adds value to the quality of learning and reduces adaptation barriers to digital-based learning (Trust & Whalen, 2020). Collaboration between teachers, the Islamic boarding school IT team, and external parties, such as educational platform developers, is expected to provide a solution to this last aspect.

Secondary, continuous monitoring and evaluation is also a crucial strategy. Regular monitoring of the usage of the digital platform, the effectiveness of online learning approach, as well as the achievability of students' competency target is essential. Supported by a systematic evaluation mechanism, a pesantren could both keep track of its realization on digitalization in the short-term, identify obstacles, adjust strategy, as well as assure the long-term facilitation of the digitalization process (Kong, 2021).

Overall, the combination of human resource capacity development, infrastructure improvement, digital content management, and ongoing monitoring and evaluation will strengthen the digitalization of learning in Islamic boarding schools. This synergy not only addresses the challenges of digital transformation in education, but also prepares At-Thahiriyah Kaloran Islamic Boarding School for the future as an adaptive, innovative, and sustainable educational institution in the 21st century (Hew et al., 2019).

CONCLUSION

This study suggests that increasing the speed of digitalization in Islamic boarding schools and sustaining its digital learning transformation need a synergy among establishing visionary leadership and policy, developing teacher's digital competencies, designing innovative learning model, providing sufficient infrastructure support, internalizing Islamic values and culture into curriculum and extracurricular activity, engaging external stakeholders as collaboration partner in order to provide critical input toward school vision successfully committed, making sure processes are on track through monitor and evaluation. Digital transformation is not only the use of technology but a true transformation of the pedagogical ecosystem to enhance the quality of learning as well as retain the identity and values of Islamic educational institutions in this era of Society 5.0.

However, this study has some limitations: it is designed as a single case study, which makes the results contextual; it uses a qualitative method that can be subjective and does not quantify how much digital transformation was used to improve student achievement. Hence, more studies are also suggested to utilize mixed-method research, participating more sides or comparative studies and describing the relationship between teacher digital competence, learning innovation and student learning achievement dealing with the Islamic character and moral values. Such a follow-up study is expected to result in a more integrated, adaptive and sustainable digital learning transformation model for Islamic educational development in Indonesia..

By implementing these suggestions, At-Thahiriyah Kaloran Islamic Boarding School can strengthen and maintain the sustainability of digitalization of learning so that it has a long-term positive impact on the quality of education and the development of student competencies.

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