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Implementation of Madrasah Policies in Realizing the Digital-Based Transformation of Islamic Religious Education Learning at MAN Tapanuli Tengah

Abdusima Nasution[1], Dimas Indianto S[2], Shobrun Jamil[3]
[1]UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan, Indonesia
[2,3]UIN Prof. K.H. Saifuddin Zuhri Purwokerto, Indonesia

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ABSTRACT

This study aims to examine the transformation from conventional learning systems to digitally oriented learning systems in Islamic Religious Education (PAI) at State Islamic Senior High Schools (Madrasah Aliyah Negeri/MAN) in Tapanuli Tengah, Indonesia. The research focuses on the implementation of digital-based learning practices at MAN 1 Tapanuli Tengah and MAN 3 Tapanuli Tengah, highlighting how digital technologies support educational development and improve learning quality in the contemporary era. A qualitative research approach was employed using interviews, observations, and document analysis as data collection techniques. The collected data were analyzed using the interactive model of Miles and Huberman, comprising data reduction, data display, and conclusion drawing. The validity of the findings was ensured through source triangulation. The findings reveal that integrating digital technology into Islamic Religious Education has significantly transformed the learning process. Digital-based learning has enhanced students' engagement, facilitated access to learning resources, and enabled the contextualization of learning materials into real-life situations. Furthermore, the use of digital platforms and educational technologies has created a more interactive and innovative learning environment, supporting both teachers and students in achieving educational objectives more effectively. The study implies that digital-based learning has become a strategic and sustainable approach for contemporary education. It offers educators opportunities to adapt instructional practices to technological advancements while maintaining educational values and improving learning outcomes. This research contributes to the growing body of knowledge on digital transformation in Islamic education and offers practical insights for policymakers and educators seeking to strengthen the implementation of digital learning in madrasah settings.

Corresponding Author:

Abdusima Nasution
UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan, Indonesia
Email:abdusima@uinsyahada.ac.id

1. INTRODUCTION

The era of modernization brought numerous advancements in both technology and knowledge [1]. The modernization currently unfolding has, in fact, had an impact on changes in various aspects, including life and education. It was estimated that this modernization has been occurring since the 19th century [2]. From a linguistic point of view, as expressed by Taufik Abdullah, modernization originated from the word modernus, with the root word modo, which carried the meaning of 'just now' and 'at present [3], an Arabic discourse, modernization is often expressed by the term tajdīd, denoting the process of renewal or making something new again [4]. Technically, modernization is a process of rationalization intended to transform traditional (old) and irrational ways of thinking or working [5]. Emile [Durkheim] also defined modernization as the division of labour (a shift in the orientation of the work system), characterized by a change from mechanical solidarity to organic solidarity. Organic solidarity refers to social relationships that prioritize mutual coexistence while emphasizing personal needs. Furthermore, there was also the term modernity, which distinguishes renewal/reformation to grow and develop superior individuals, who were high-quality in terms of knowledge, technology, and character, to achieve the desired goals [6]. The meaning of modernization was a form of change carried out in response to dynamics within conventional systems and mechanisms toward a situational approach.

Islamic education essentially strengthened an individual's inner self in upholding the values of religious guidance, which were manifested in the value system and regional virtues of the society in which the individual lived. National education and Islamic education shared common objectives. National education developed processes aimed at producing individuals who were devout, moral, physically and spiritually healthy, knowledgeable, and of high quality. Meanwhile, Islamic education was fully oriented toward achieving fundamental goals for both worldly life and the hereafter [7]. It is further explained that Islamic education shapes an Islamic human civilization in spiritual, material, and structural dimensions. The spiritual dimension includes ideology, morality, science, and ethics. The structural dimension can be understood as the formation of family, social, and governmental structures. Meanwhile, the material dimension refers to development in agriculture, industry, trade, and other forms of life activities that support the sustainability of spiritual and ideological values. In the modern era, Islamic education, along with its educational institutions, appears to be obliged to operate professionally, as contemporary society has developed in line with changes that emphasize rationality [2].

In relation to the modernization of education, this has a very significant impact on the educational world in making educational needs relevant to the rapid pace of social change. At the very least, there are three essential aspects involved in the process of educational modernization, especially in Islamic religious education: (1) the development of expertise in specific fields, (2) the mastery of skills in accordance with the demands of the times, and (3) the cultivation of sound and constructive thinking. (Anas Nur Wahidin, 2022). In principle, Islamic education does not reject technology as a primary means in the modernization of Islamic religious education, despite many accusations that justify the view that technology damages educational values. As often alleged, advanced technology

has indeed succeeded in providing convenience for the sustainability of human life; however, it has also contributed to moral decline, thereby eroding values and the fundamental pillars of life [1]. In fact, this is not necessarily the case; rather, technological development has created creative individuals who transform ways of thinking, enhance creativity and innovation, and add value to humanity. Responding to the above argument, M. Amin Abdullah in Wahdaniya states that to modernize Islamic education, at least five alternative formulas can be implemented, namely:

a. Introducing the realities of contemporary Muslim life through a sociological approach.
b. Islamic knowledge should be conveyed through historical studies rather than doctrinal teachings. Historical analysis will foster critical and constructive studies, resulting in the development of new intellectual treasures.
c. Contextual learning by combining textual sources (verses or proofs) with real societal conditions as a manifestation of the textual teachings.
d. Sufism (Tashawuf) should be practiced and combined with an emphasis on cognitive aspects.
e. Educational outcomes should cultivate both individual and social piety [1].

The modernization of Islamic Religious Education is an imperative. Improvement and refinement of educational components become the starting point and main focus. The modernization of Islamic Religious Education enhances the quality of Islamic education, enabling progressive learning in line with contemporary expectations and demands. The paradigm emerging from the modernization of Islamic religious education not only shifts the dichotomy between religious education and general education but also fosters the development of Islamic science encompassing both naqliyah (transmitted knowledge) and aqliyah (rational knowledge), which has implications for the transfer of knowledge processes across curricula, institutions, and institutional identity [8].

2. METHOD

This study employed a qualitative research approach to gain a comprehensive and in-depth understanding of the implementation of digital-based learning in Islamic Religious Education (PAI) at MAN Tapanuli Tengah. The qualitative approach was considered appropriate because the phenomenon under investigation involves social interactions, perceptions, experiences, and educational practices that cannot be adequately explained through numerical data alone. Instead, qualitative inquiry enables researchers to explore participants' perspectives and interpretations regarding the integration of digital technology into the teaching and learning process.

The selection of a qualitative approach was based on several considerations. First, qualitative research facilitates the establishment of natural, meaningful relationships between the researcher and participants during data collection. Such relationships allow participants to express their experiences and opinions openly, thereby generating rich and authentic information. Second, this approach enables direct interaction between the researcher and participants, allowing exploration of complex educational phenomena in greater depth. Third, qualitative methods provide flexibility in investigating emerging issues and allow researchers to capture contextual realities that may not be identified

through structured quantitative instruments. Finally, this approach enhances the credibility and authenticity of the findings by focusing on participants' lived experiences and real-world educational practices.

The participants in this study were selected using purposive sampling, a technique commonly employed in qualitative research that identifies individuals with relevant knowledge and experience regarding the phenomenon under study. The selection criteria required participants to be directly involved in the implementation of digital-based learning and to have sufficient experience in the educational process within the school environment.

Three key informants participated in this study. Although the number of participants was limited, each informant represented a distinct stakeholder group and played a significant role in implementing digital learning. The first participant was the principal, responsible for institutional leadership, educational policy implementation, and strategic decision-making related to the school's digital transformation. The second participant was an Islamic Religious Education teacher who was directly involved in planning, implementing, and evaluating digital-based learning activities. The third participant was a student who actively participated in digital learning and provided firsthand insights into learning experiences, challenges, and perceived benefits.

The inclusion of these three participants was intended to ensure the representation of different perspectives within the educational environment. By involving school leadership, teaching staff, and students, the study obtained a more comprehensive understanding of how digital-based learning is planned, implemented, and experienced at MAN Tapanuli Tengah. Furthermore, the use of key informants enabled the researcher to collect detailed, information-rich data relevant to the study's objectives.

Table 1. Profile of Respondents

Code	Positioning	Note
R1	Principal	Leader of Instituion
R2	Teacher	Guiding the teaching process
R3	Student	Fellow

The data obtained from these participants were used to explore the transformation of conventional learning practices into digital-based learning systems and to identify the opportunities, challenges, and educational impacts associated with the integration of digital technology in Islamic Religious Education.

3. RESULTS AND DISCUSSION

3.1. Results

Digital-Based Transformative Learning Practices in Islamic Religious Education at MAN Tapanuli Tengah

Digital-based Islamic Religious Education (IRE) learning in madrasahs has been implemented (since 2022), supported by careful planning and adequate infrastructure, including both hardware and network facilities. Technologies such as LCD projectors, Learning Management Systems (LMS), Google Classroom, and Madrasah e-learning platforms are utilized for content delivery, assignment distribution, and the administration

of Computer-Based Tests (CBT), which can be accessed through devices such as smartphones. This system is applied across all IRE subjects, including Fiqh, Qur'an–Hadith, Aqidah Akhlak, and Islamic Cultural History (SKI), and is further supported by interactive learning media such as animations and quizzes. The implementation of these digital learning models has enhanced accessibility, interactivity, and the overall effectiveness of the teaching and learning process.

> R1 (Principal): "Digital-based Islamic Religious Education (IRE) learning has been implemented for approximately two years (since 2022) with careful planning. The facilities and infrastructure are well prepared, including devices and network support such as LCD projectors, Learning Management Systems (LMS), Google Classroom, and Madrasah e-learning platforms. This form of digital learning is used to distribute learning materials and assignments and in administer examinations. The examinations are conducted using a Computer-Based Test (CBT) system. These digital platforms are utilized across all subjects, including IRE subjects such as Aqidah Akhlak, Fiqh, Qur'an–Hadith, and Islamic Cultural History (SKI). In the learning process, interactive learning media such as animations and interactive quizzes are also employed."
>
> R2 (IRE Teacher): "In teaching Islamic Religious Education subjects at the madrasah, including Fiqh, Qur'an–Hadith, Aqidah Akhlak, and SKI, we apply digital learning systems in accordance with the programs that the madrasah has established."
>
> R3 (Student): "In learning IRE subjects, we use several learning models such as Google Classroom and LMS. For examinations, we use the CBT system so that we can access and read the questions through our mobile phones."

Islamic Religious Education (IRE) learning at MAN 3 Tapanuli Tengah has utilized various digital platforms, including Madrasah e-learning, Google Classroom, Zoom, and Google Meet, as well as visual media such as videos and animations. However, digital-based learning has been adopted by only some teachers, particularly younger educators, while senior teachers tend to have limited technological proficiency. Of the eight IRE teachers, only four actively employ digital learning media in their instructional practices.

In the administration of examinations, a Computer-Based Test (CBT) system has been implemented to distribute test items, track students' test completion, and automate assessment without manual grading. The selection of digital learning media is adjusted to the instructional needs of the subject matter; for instance, teachers search for online instructional videos when teaching Fiqh. Although some teachers demonstrate adequate digital competence, technical challenges—such as forgetting how to operate certain applications—occasionally occur. In such cases, fellow teachers provide support to assist with the operation of digital tools.

> R1 (Principal):
>
> "At MAN 3 Tapanuli Tengah, IRE learning has utilized various platforms such as Madrasah e-learning and Google Classroom, as well as visual media like instructional videos. In addition, learning materials are also presented in the form of animations. However, only some teachers use digital learning media, particularly

senior teachers, who tend to have difficulty operating digital learning technologies. Of the eight IRE teachers, only four are capable of and actively use digital-based learning. The implementation of digital learning in examinations has adopted the CBT system, starting from the distribution of test questions to students' completion of the exams. With this CBT system, teachers no longer need to manually grade the exams, as the assessment process is automated within the application."

R2 (IRE Teacher):

"In teaching, we use applications such as videos. Sometimes we also use Google Classroom, and on other occasions Zoom or Google Meet. Our teaching methods are tailored to the subject matter. For Fiqh lessons, for example, we search for or browse instructional videos related to the topic."

R3 (Student):

"Our teachers use applications in teaching. Overall, they are quite good and skilled in using them. However, they sometimes experience difficulties because they forget how to use certain features. In such situations, we help them with the operation of the applications."

Supporting and Inhibiting Factors in the Implementation of Digital-Based Islamic Religious Education Learning at MAN Tapanuli Tengah

MAN 1 Tapanuli Tengah

The implementation of digital-based Islamic Religious Education (IRE) learning at MAN 1 Tapanuli Tengah has received strong support from the school administration, teachers, and students, and is reinforced by the availability of supporting facilities. Nevertheless, several challenges remain. These include students who do not bring or own digital devices (smartphones), unstable internet connectivity, and uneven installation of digital facilities across classrooms. In addition, for certain subjects such as Fiqh, not all learning materials can be delivered through digital media, as they require contextual and hands-on practice. To address these obstacles, the madrasah has adopted a blended learning approach and continues instruction through conventional teaching methods when digital learning encounters technical difficulties. This strategy ensures the continuity of the learning process despite existing limitations.

R1 (Principal):

"All stakeholders support the implementation of digital learning. However, several obstacles are encountered, such as students not bringing digital devices (smartphones), limitations due to unstable internet signals, and some students who do not own smartphones. To overcome these challenges, blended learning is implemented so that the learning process is not disrupted. There are two main barriers to implementing digital-based IRE learning. First, not all classrooms are equipped with digital facilities, which requires sharing time and space to ensure equitable access to digital e-learning. Second, in IRE learning—particularly Fiqh—not all materials can be delivered digitally, as Fiqh requires direct, contextual practice. Although visual media can serve as examples, hands-on practice remains essential."

R2 (IRE Teacher):

"In terms of supporting factors, all parties provide support, including the school, students, and available facilities. However, learning can sometimes be disrupted when some students experience difficulties with smartphone access or internet connectivity. When such constraints occur, the learning process is continued using conventional methods."

R3 (Student):

"Some of our friends do not have smartphones."

MAN 3 Tapanuli Tengah

Supporting access for the implementation of digital-based IRE learning at MAN 3 Tapanuli Tengah is generally available, although it has not yet reached full adequacy. The number of laptops and LCD projectors remains limited and insufficient to accommodate all classrooms. Therefore, an increase in the number of digital devices and applications is necessary. The primary obstacle lies in teachers' limited technological competence, particularly among senior teachers, who have difficulty operating computers despite their willingness to learn.

The madrasah has made efforts to provide learning tools and digital applications; however, time constraints also pose a challenge. Some classrooms are still not equipped with LCD projectors, although overall the implementation of digital-based learning has proceeded relatively well.

R1 (Principal):

"The supporting access for implementing digital-based IRE learning can be considered adequate, although it is not yet fully complete. The limited number of laptops and LCD projectors is insufficient for all classrooms, necessitating increased availability of digital applications and devices. One of the main inhibiting factors in implementing digital-based IRE learning is teachers' limited ability to operate digital learning technologies."

R2 (IRE Teacher):

"Sometimes there are teachers, especially senior ones, who do not yet understand how to use computers. Nevertheless, they continue to make efforts to learn. Moreover, the madrasah has attempted to provide learning tools and applications."

R3 (Student):

"There are no major problems. Sometimes the time feels insufficient, perhaps because learning is engaging. Some classrooms still lack LCD projectors, but overall, the situation is quite good.

Effectiveness of Pre- and Post-Digital-Based Islamic Religious Education Learning on the Teaching–Learning Process at MAN Tapanuli Tengah

MAN 1 Tapanuli Tengah

Digital-based Islamic Religious Education (IRE) learning at the madrasah has been implemented since 2022, replacing the conventional instructional system. This implementation has proven effective, as evidenced by increased enthusiasm among both

students and teachers during the learning process. Teachers feel supported in delivering instructional content, and digitalization has also contributed to budget efficiency by reducing paper use for learning activities and examinations. Learning outcomes have shown significant improvement, both in classroom instruction and examination results.

The effectiveness of digital-based learning is closely linked to thorough preparation prior to implementation. Students report higher levels of enjoyment, teachers demonstrate greater motivation, costs are reduced, and examination outcomes improve—particularly when teachers possess sufficient proficiency in using digital platforms.

R1 (Principal):

"Before the digital transformation of IRE learning, the teaching process was conducted using conventional methods. However, after the implementation of digital-based learning, the effectiveness of instruction has become evident. This is reflected in students' seriousness in learning and teachers' motivation to become more technologically literate. In terms of content delivery, digitalization enables students to grasp the material more quickly, as digital media have become part of their daily lives through the visual content they frequently access on their gadgets. Moreover, communication between teachers and students has become easier. Regarding learning outcomes, there has been a significant improvement when comparing students' achievement before and after the implementation of digital-based learning. This indicates that one of the key factors contributing to the effectiveness of digital-based learning is students' increased motivation resulting from the transition from conventional to digital learning."

R2 (IRE Teacher):

"There are clear advantages to using digital-based learning. Teachers are encouraged to learn and utilize available applications continuously. Teaching becomes more flexible with digital support. Overall, when compared to conventional learning methods previously used, digital-based learning is significantly more effective."

R3 (Student):

"There is a noticeable difference. Previously, learning felt monotonous—mostly taking notes and listening. With digital learning, it is more enjoyable because of the images, examples, and the challenge of learning both the subject matter and how to use technology."

Table 2. The Digital Transformation of Islamic Religious Education Learning at MAN 1 and MAN 3 Tapanuli Tengah

Comparison of Digitally-Based PAI Learning	MAN 1	MAN 3
Forms of Digital Transformation	- Aplikasi LMS - Google Classroom - E-learning Madrasah - CBT - Interactive; Animations and Quizes	- E-Learning Madrasah - Google Classroom - Zoom - Google Meet - Media Audio Visual - CBT
Supporters and Inhibitors of	- Supporters	- Supporters

Digital Adoption	- Infrastructure - Teacher - Students - Inhibitors - Students Don't Have a Cellphone - Internet disruption - Limited Devices	- Digitally Acces - Inhibitors - Limited number of laptops - Teacher Abilities - Time Constraints
The Effectiveness of Digital Learning	- Effective Learning - Students' Seriousness - Technology Mastery - Ease of Learning - Increased Yield Value - More Interesting - Interaktif - Varied	- Teacher and Student Spirit - Teachers Helped - Budget Efficiency - Successful Learning - Test Scores Increase

The findings of this study indicate that digital-based Islamic Religious Education (IRE) learning has been implemented at MAN 1 and MAN 3 Tapanuli Tengah since 2022. Both educational institutions have adopted digital learning practices primarily in response to the directives of the Ministry of Religious Affairs of the Republic of Indonesia aimed at realizing the concept of a Digital Madrasah within the learning process. While there are similarities and differences in the mechanisms of implementing digital-based IRE learning, these differences are not substantial, as both madrasahs adhere to the same national policy framework issued by the Ministry of Religious Affairs.

A key similarity observed is that both institutions consistently involve essential supporting elements in the implementation process, including the principals, teachers, students, and other relevant stakeholders. These educational actors collectively utilize digital-based Islamic Religious Education learning—covering subjects such as Qur'an–Hadith, Aqidah Akhlak, Fiqh, and Islamic Cultural History—to enhance the quality and excellence of the madrasahs. Based on the investigation of digital-based IRE learning transformation, several points of similarity can be identified as follows:

a. The form of digital-based Islamic Religious Education learning transformation involves the use of shared applications at both MAN 1 and MAN 3, namely Madrasah E-Learning, Google Classroom, and Computer-Based Tests (CBT).
b. Supporting factors in the implementation of digital-based IRE learning transformation include the readiness of the madrasah community, particularly principals, teachers, and students. In contrast, inhibiting factors consist of limited infrastructure, such as classrooms not yet equipped with LCD projectors and laptops, the lack of smartphones among some students, and the limited digital competence of certain teachers in operating digital learning technologies.
c. The effectiveness of digital-based Islamic Religious Education learning provides a new learning atmosphere, enhances motivation among both teachers and students, and contributes to improved learning outcomes.

Effectiveness of Pre- and Post-Digital-Based Islamic Religious Education Learning on the Teaching–Learning Process

The effectiveness of digital-based Islamic Religious Education learning, which has transformed from conventional methods to digital approaches since 2022, has resulted in significant positive impacts. The implementation of digital learning has made the teaching–learning process more effective, interactive, and diverse, thereby enhancing teachers' motivation, students' engagement, and the quality of students' understanding of instructional materials. Students' familiarity with visual media through digital devices has facilitated faster comprehension, while teachers have benefited from greater ease in delivering content. A comparative analysis of learning outcomes before and after digitalization indicates a clear improvement in student achievement, along with increased budget efficiency from reduced paper use. The success of this transformation is strongly influenced by thorough preparation and teachers' proficiency in operating digital platforms. Overall, digital-based IRE learning fosters a more engaging, cost-efficient learning environment and produces better learning outcomes compared to conventional instructional methods.

3.2. Discussion

Forms of Digital-Based Islamic Religious Education Learning Transformation and Their Impact on Learning Outcomes

The transformation of digital-based Islamic Religious Education learning and its impact on learning outcomes at MAN 1 and MAN 3 Tapanuli Tengah reflects a shift from conventional instructional systems to digital learning environments. This transformation involves the use of Learning Management Systems (LMS), Madrasah e-learning platforms, Google Classroom, Zoom, Google Meet, and interactive media such as animations and quizzes. Furthermore, assessment practices have undergone transformation, shifting from manual examination methods to Computer-Based Tests (CBT) as tools for measuring and evaluating student learning outcomes.

Fundamentally, this digital learning transformation originated from the COVID-19 pandemic in 2019. The pandemic necessitated the implementation of quarantine policies to curb the virus's spread. These measures not only affected social life but also profoundly impacted the education system, compelling educational institutions to adopt digital learning models as an alternative to conventional face-to-face instruction. This phenomenon was not only experienced in Indonesia but was also observed in educational institutions worldwide [9]. The transformation of learning through digital and e-learning modalities has increasingly become a dominant trend in the global education landscape [10]. In response to the growing demands of the education sector, the educational industry has been compelled to develop online learning applications using digital technologies [11]. When compared with face-to-face instruction, online learning has the potential to exert a stronger influence on students' academic performance, achievement, and satisfaction.

E-learning constitutes a distinctive learning system characterized by diverse features and unique challenges [12]. Implementing e-learning requires identifying several key factors, including instructor and student characteristics, technological infrastructure,

learning systems, online learning resources, and institutional support and training [13]. E-learning, which is electronically mediated, is not necessarily equivalent to fully online learning [14].

One of the e-learning platforms employed in the learning process is the Learning Management System (LMS) [15]. The Learning Management System (LMS) is one form of e-learning platform that facilitates interactive learning without the limitations of time and place, provided an internet connection is available [16]. In addition, LMS functions as a complementary tool to face-to-face instruction by offering structured access to learning materials, information delivery, assignments, examinations, and learning outcome assessment [17]. LMS provides information that enables users to interact through features such as instructional design, assignment repositories, task measurement, and assessment, allowing these data to be used to monitor student performance [18].

Educational transformation is an imperative, today and in the future, people worldwide, in general, and Indonesian society in particular, are technologically oriented in almost every aspect of their lives [19]. Technology would always accompany life in work, learning, and daily activities. From this condition, a new society will emerge, characterized as a 'knowledge-based society,' which necessitates that education also evolve into a means of societal transformation. The changes that were happening and would continue to occur constitute the essence of transformation.

The concept of educational transformation, according to [20], states that transformation is a process of creating something new or a new situation that originates from knowledge and technology. Gunawan [21] argues that educational transformation is an effort to shift from an ordinary to a more perfect and well-established form. Thus, it can be understood that the essence of transformation lies in bringing about change toward a better condition. This change is realized by making education a process of transformation. This is because the educational community is both the object and the subject of educational transformation—they are the ones who change, and they are also the ones who transform.

The steps involved in the process of educational transformation include three main aspects: curriculum transformation, transformation of educational goals, and transformation through the preparation of infrastructure, facilities, and other supporting elements. The curriculum must be designed and presented in ways that align with the demands and realities of the modern era. This includes learning planning, the learning process, evaluation, and the policies that are produced [22]. Educational goals are crucial because they provide the direction for achievement. These goals will be reconstructed in the form of teaching methods, learning strategies, instructional models, and learning techniques. All of these serve as the foundation for implementing education. Furthermore, facilities and infrastructure—including moral and material support as well as the availability of budgets for educational institutions—also serve as key determinants in the process of educational transformation.

Education in the 21st century demands the development of knowledge and technology as the main capital for improving the quality of education [23]. Educational transformation in the 21st century involves integrating subjects or fields of study with contemporary issues, alongside the development of 21st-century skills. Thus, a

multidisciplinary learning process is established, grounded in: (1) learning and innovation skills, (2) information, media, and technology skills, and (3) life and career skills [23]. Accordingly, educational transformation becomes the cornerstone of a new life paradigm within the educational community, oriented toward collective advancement.

Solution-Oriented Responses to Supporting and Inhibiting Factors in the Implementation of Digital-Based Islamic Religious Education Learning

The implementation of digital-based Islamic Religious Education (IRE) learning in madrasah has been supported by strong commitment from the school administration, teachers, and students, as well as by the availability of existing facilities. Nevertheless, supporting infrastructure such as laptops, LCD projectors, and internet connectivity has not been evenly distributed across all classrooms, and the number of available devices remains limited [24]. Other challenges include students without digital devices, unstable internet signals, and limited technological competence among teachers—particularly senior teachers—in using digital tools. In addition, for certain subjects, such as Fiqh, not all instructional content can be delivered through digital media due to the need for direct, contextual practice [25]. To address these challenges, the madrasahs have implemented a blended learning approach and reverted to conventional teaching methods when digital learning is disrupted, ensuring the continuity of the learning process. Efforts to increase the number of devices, ensure equitable distribution of facilities, and enhance teachers' digital competencies are essential steps toward optimizing digital-based IRE learning in the future.

4. CONCLUSION

This study demonstrates that the digital transformation of Islamic Religious Education (PAI) at MAN Tapanuli Tengah represents an important institutional adaptation to contemporary educational demands. Rather than merely introducing technological tools into classroom activities, the transformation reflects a broader shift toward more flexible, student-centered, and technology-supported learning practices. The findings suggest that digital learning environments can facilitate greater accessibility to learning resources, encourage active student engagement, and support the development of educational practices that are responsive to technological advancement while maintaining the core values of Islamic education.

The study further indicates that the sustainability of digital transformation depends on the alignment of three key dimensions: technological infrastructure, human resource capacity, and institutional support. Digital learning initiatives are more likely to succeed when schools possess adequate technological facilities, educators are equipped with appropriate digital competencies, and school leaders provide strategic direction for educational innovation. Consequently, digital transformation should be viewed as a comprehensive organizational process rather than a purely technological intervention.

Several limitations should be acknowledged. First, the study was conducted within a limited institutional scope, involving only MAN Tapanuli Tengah, which may restrict the transferability of the findings to other madrasah contexts. Second, the qualitative design

and the use of a small number of key informants were intended to obtain in-depth insights rather than generate broadly generalizable conclusions. Third, the regional focus of the study reflects the specific educational, technological, and socio-cultural conditions of Tapanuli Tengah, which may differ from those of other regions in Indonesia.

Based on the findings, several recommendations can be proposed for policymakers and educational practitioners. For the Ministry of Religious Affairs, sustained investment in digital infrastructure, internet connectivity, and digital learning ecosystems across madrasahs is essential to reduce disparities in technological access. In addition, national policies should prioritize the development of standardized digital learning frameworks that support the integration of technology into Islamic education.

For madrasah leadership, strategic planning should focus on strengthening institutional readiness by providing technological resources, establishing digital learning support systems, and promoting a culture of innovation among teachers and students. School leaders should also implement continuous monitoring and evaluation mechanisms to ensure the effective utilization of digital learning platforms.

For teacher development programs, professional training should move beyond basic technological skills and emphasize pedagogical competencies for digital instruction. Continuous professional development initiatives should equip teachers to design interactive learning experiences, use digital assessment methods, and integrate Islamic values effectively in technology-enhanced learning environments.

Future research may expand the scope of investigation by involving multiple madrasahs from different regions, employing mixed-methods or quantitative approaches, and examining the long-term effects of digital transformation on students' academic achievement, digital literacy, character development, and religious understanding. Such studies would contribute to a more comprehensive understanding of sustainable digital transformation within Islamic education.

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