



**Digital Learning Implementation in Infrastructure-Limited Areas
at SDN 02 Suka Merindu**

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Abstrak: Perkembangan teknologi pada abad ini berevolusi menjadi alat pembelajaran. Penting bagi guru untuk mengintegrasikan teknologi saat menerapkan pembelajaran. Namun penggunaan teknologi dalam pembelajaran bagi guru memiliki berbagai tantangan tersendiri. Penelitian ini bertujuan untuk menganalisis implementasi pembelajaran berbasis digital di SD Negeri 02 Suka Merindu serta mengidentifikasi tantangan yang dihadapi dalam pelaksanaannya. Penelitian menggunakan pendekatan kualitatif dengan desain studi kasus. Data diperoleh melalui wawancara, observasi, dan dokumentasi yang melibatkan kepala sekolah, guru, dan siswa. Analisis data dilakukan melalui reduksi data, penyajian data, dan penarikan kesimpulan dengan menggunakan triangulasi sumber dan teknik untuk menjamin keabsahan data. Hasil penelitian menunjukkan bahwa pembelajaran berbasis digital mampu meningkatkan motivasi dan keterlibatan para siswa dalam proses pembelajaran. Penggunaan aplikasi seperti WhatsApp, Google Classroom, dan Zoom membantu guru dan siswa dalam mendapatkan materi pembelajaran secara fleksibel. Akan tetapi, keterbatasan perangkat dan akses internet yang tidak stabil masih menjadi hambatan utama dalam pelaksanaan pembelajaran digital. Dalam perspektif pendidikan Islam, penggunaan teknologi digital tidak hanya diarahkan untuk meningkatkan kualitas pembelajaran, tetapi juga untuk membentuk karakter para siswa agar mampu menggunakan dan memanfaatkan teknologi secara bijak dan bertanggung jawab sesuai nilai-nilai Islami. Oleh karena itu, diperlukan peningkatan infrastruktur teknologi, pelatihan berkelanjutan bagi guru, serta dukungan dari pihak sekolah, pemerintah, dan orang tua agar pembelajaran digital dapat berjalan lebih efektif khususnya di daerah terpencil.

Kata Kunci: Pembelajaran digital, Teknologi informasi dan komunikasi, Pendidikan islam, Infrastruktur terbatas, Sekolah dasar

Abstract: Technological developments in this century have evolved into learning tools. It's crucial for teachers to integrate technology into their teaching. However, using technology in learning presents various challenges for teachers. This study aims to analyze the implementation of digital-based learning at SD Negeri 02 Suka Merindu and to identify the challenges faced in its implementation. The study employs a qualitative approach with a case study design. Data were collected through interviews, observations, and documentation involving the principal, teachers, and students. Data analysis was conducted through data reduction, data presentation, and drawing conclusions using source triangulation and techniques to ensure data validity. The results of the study indicate that digital-based learning is capable of enhancing students' motivation and engagement in the learning process. The use of applications such as WhatsApp, Google Classroom, and Zoom assists teachers and students in accessing learning materials flexibly. However, limited devices and unstable

internet access remain the primary obstacles in the implementation of digital learning. From an Islamic education perspective, the use of digital technology is not only aimed at improving the quality of learning but also at shaping students' character so they can use and leverage technology wisely and responsibly in accordance with Islamic values. Therefore, improvements in technological infrastructure, ongoing training for teachers, and support from schools, the government, and parents are necessary to ensure that digital learning can be implemented more effectively, particularly in remote areas.

Keywords: Digital learning, Information and communication technology, Islamic education, Limited infrastructure, Elementary schools

INTRODUCTION

In this digital era, the internet has evolved into a learning tool that offers various benefits and conveniences (Sholeh, 2019). The rapid development of digital technology has transformed all aspects of human life, including education. Various information technology devices, such as smartphones, computers, laptops, and mobile phones, as well as the rapid development of global internet networks, are evidence of significant technological progress, especially in the field of information and communication network (Hanannika & Sukartono, 2022). This technology has transformed the way learning relies on creative and interactive learning media to improve outcomes. Education needs to adapt to these changes to meet the needs of an increasingly digital society (Utomo, 2023).

With technology, students can access learning materials in a more diverse and flexible way, and teachers can deliver them in a more engaging and effective manner. This aligns with research (Aprillia et al., 2023). which shows that teachers and students are expected to utilize technology in the learning process because technology plays a crucial role in the smooth running of education. While research on the various challenges faced by practitioners in integrating technology in rural schools is essential, efforts to identify solutions and actionable steps are equally important. Furthermore, the solutions developed must be tailored to the characteristics of rural schools, given the limited access to resources available to teachers and students in these areas compared to schools in urban areas (Mustafa et al., 2024).

As stated Selwyn (2011), digital technology used in educational institutions functions as a learning aid, both to access information as a learning resource and to support learning activities and related assignments (Salsabila et al., 2020). With current technological developments, internet connections allow students to connect with their teachers through various applications such as WhatsApp Groups, Zoom, Google Classroom, and others (Dhori et al., 2021).

Furthermore, the findings of this study are consistent with those reported by Van Deursen & Van Dijk, (2014). Their study identified several theoretically validated categories

of Internet use, including information seeking, news access, personal development, social interaction, recreational activities, commercial transactions, and gaming. Based on this classification, the researchers found significant differences in Internet usage patterns influenced by factors such as gender, age, educational background, and Internet experience. These findings support the concept of the digital divide, which highlights variations in access to and utilization of digital technology among different groups in society. In general, as the Internet continues to evolve and become more integrated into everyday life, patterns of Internet use increasingly reflect existing social, economic, and cultural conditions, including various forms of inequality present in society.

The use of ICT is considered to improve the quality of learning and facilitate student understanding of the material being taught (Anggraeny et al., 2020). Technology-based learning has advantages such as flexibility in time and location, rich learning resources, and more appropriate evaluation methods. Furthermore, technology also enables personalized learning, meaning students can learn at a pace and method that suits their needs. This can increase student motivation and engagement in the learning process. With data analysis, this allows teachers to directly track student progress and provide faster and more appropriate feedback to help students who are experiencing difficulties with more effective results (Baharuddin & Hatta, 2024).

The findings of the study conducted by (Trismiani, 2024) indicate that the use of digital technologies, such as learning applications, interactive media, and social media platforms, can enhance students' motivation and participation in the learning process. However, the study also revealed several challenges, including limited access to technology and insufficient training opportunities for teachers. These findings are relevant to the present study, as both examine the implementation of digital learning in elementary schools and the various challenges faced by teachers in utilizing technology as a medium for instruction.

From an Islamic educational perspective, technology is not only used as a learning tool but also as a medium for developing character, morals, and responsibility in students' use of digital information. The use of technology in learning must be directed towards wise, responsible use, and in accordance with Islamic values. Therefore, the integration of technology in Islamic basic education is not only oriented towards improving learning outcomes but also towards developing students' morals and ethics in the use of digital media.

Based on initial observations made by researchers, SDN 02 Suka Merindu is one of the schools that has implemented digital learning. Despite the school's efforts to integrate technology into the learning process, several challenges remain. These challenges include limited technological devices, teacher expertise, and inadequate infrastructure. This

undoubtedly poses a significant obstacle to the advancement of digital-based learning, especially for schools located in areas lacking adequate technological facilities.

Digital-based learning has been widely discussed in educational literature. Numerous studies have shown that it helps students become more motivated, provides them with greater access to learning resources, and develops modern 21st-century skills such as problem-solving, creativity, and collaboration. Educational technology uses a variety of tools to enhance teaching and learning. Educational games, interactive simulations, and instructional videos make learning more engaging and effective. These methods enhance students' understanding of the material and increase their engagement in the learning process (Muzaini et al., 2024).

However, several issues frequently arise in digital-based learning when implementing technology. These issues include technology accessibility, limited infrastructure, teacher skills, and students' inability to use digital devices (Wahyudi & Jatun, 2024). Ahunaya et al., (2025) also revealed that the implementation of digital learning is hampered by gaps in technology access, low digital literacy, and a lack of teacher training. Nisak & Rofi'ah, (2023) also stated that the challenges of digital learning are influenced by teachers' inability to understand and operate digital learning, long time commitments to digital media use, students' inexperience, and inadequate infrastructure. Several previous studies have focused on the effectiveness of digital learning in schools with adequate facilities. However, research on the implementation of digital learning in Islamic elementary schools in areas with limited infrastructure remains limited. Furthermore, the integration of Islamic educational values into the use of learning technology has not been studied in depth.

This study builds on previous research, but with a more specific focus on elementary schools in remote areas, such as SDN 02 Suka Merindu. The study aims to broaden understanding of the factors influencing the success or failure of implementing digital-based learning in elementary schools in areas with limited infrastructure. Furthermore, the study aims to provide recommendations for more effective use of technology in the learning process, consistent with Islamic educational values.

The novelty of this research lies in its analysis of the implementation of digital learning in Islamic elementary schools in areas with limited infrastructure, emphasizing the integration of Islamic educational values into the use of learning technology. This research not only discusses the effectiveness of technology use in learning but also examines how technology is utilized as a tool for character building and student responsibility in the use of digital media.

This study is unique because no previous research has specifically examined the implementation of digital-based learning at SDN 02 Suka Merindu, a school located in an

area with limited technological infrastructure. This research is expected to provide new insights into the various challenges faced by schools in areas with limited access to technology. The study aims to describe the implementation of digital-based learning at SD Negeri 02 Suka Merindu, identify the supporting and inhibiting factors affecting its implementation, and analyze the integration of Islamic educational values in the use of digital technology within the learning process in infrastructure-limited areas. Furthermore, this research is expected to offer practical solutions to overcome these challenges. Therefore, the findings of this study are anticipated to contribute to the development of digital-based educational policies, particularly for Islamic elementary schools in regions with limited technological resources.

METHOD

This research fundamentally utilizes a qualitative descriptive approach, specifically employing a case study design. This methodology was selected to conduct an in-depth exploration of how digital-based learning is implemented at SD Negeri 02 Suka Merindu. This school is situated in a region characterized by limited technological infrastructure, making it a highly relevant context. Ultimately, this research strives to comprehensively describe the practical execution of digital learning, identifying supporting factors and various obstacles encountered by teachers and students throughout the educational process.

The selected geographical location for this field research was SD Negeri 02 Suka Merindu, located in Rambai Kaca Village, Suka Merindu District, Lahat Regency. To gather meaningful qualitative insights, the informants were meticulously chosen, consisting of one school principal, five classroom teachers, and ten elementary students. All informants were actively participating in the execution of digital-based learning. These individuals were selected through a purposive sampling technique, deliberately taking into account their continuous, hands-on involvement in the school's daily digital education activities.

Regarding the research subjects, the study categorized participants based on their distinct educational roles. The school principal was examined as the primary manager of learning policies. Teachers were positioned as the frontline implementers of digital pedagogy, while students were observed as the direct users of digital media. Concurrently, the core object of this research was the practical implementation of digital-based learning itself. This encompasses the utilization of technological devices and educational applications, alongside an evaluation of their overall impact on elementary learning effectiveness.

To ensure a robust accumulation of data, collection techniques relied heavily on in-depth interviews, direct observations, and thorough documentation. Researchers conducted

semi-structured interviews with the principal, teachers, and students to elicit narratives regarding their practical experiences, the technological obstacles faced, and their efforts in facilitating digital learning. Direct, on-site observations were carried out to monitor digital-based classroom activities, media utilization, and teacher-student interactions. Additionally, documentation such as photographs, learning tools, and official school records was compiled to firmly supplement the primary field data.

To guarantee the credibility and trustworthiness of the gathered information, data validity was rigorously ensured through the application of source and technical triangulation. Source triangulation was systematically executed by cross-referencing and comparing the information provided by the school principal, the teaching staff, and the student body. Meanwhile, technical triangulation was meticulously carried out by contrasting the empirical data derived from the varied collection methods—specifically aligning interview transcripts, field observation notes, and documentary evidence—thereby establishing a higher degree of research validity and overall reliability.

The final phase of the study involved a rigorous thematic data analysis, systematically executed through three methodological stages: data reduction, data presentation, and conclusion drawing (as illustrated in Figure 1). During data reduction, researchers carefully filtered and focused exclusively on information directly relevant to the research questions. Subsequently, the refined data was presented in a detailed descriptive format to enhance the comprehensibility of the empirical findings. The concluding stage involved synthesizing these insights to draw definitive, well-substantiated conclusions regarding the school's digital learning implementation.

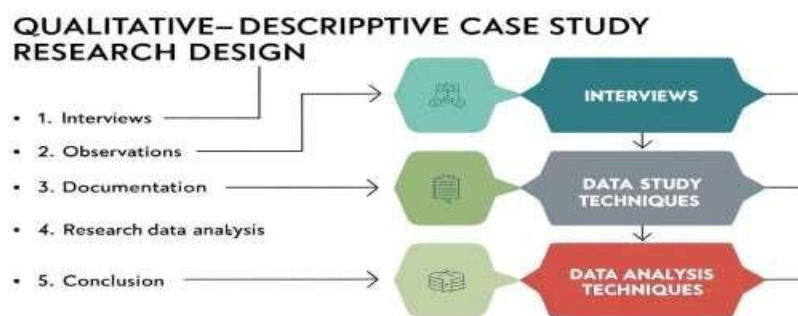


Figure 1. Data Analysis Chart

RESULTS AND DISCUSSION

Results

This research was conducted at Suka Merindu 02 Public Elementary School, located in Rambai Kaca Village, Suka Merindu District, Lahat Regency. Based on in-depth

interviews, observations, and documentation, it was found that the school has attempted to implement digital-based learning despite facing various technological infrastructure limitations.

Interviews with classroom teachers revealed that the use of applications such as WhatsApp, Google Classroom, and Zoom facilitates more flexible communication and delivery of learning materials. Teachers can share materials and assignments, and interact with students online. Students also stated that digital learning allows them to access learning materials anytime and anywhere, thus supporting student independence.

Based on observations, the use of instructional videos and interactive media increased student enthusiasm for the learning process. Students appeared more active when teachers used digital media compared to conventional learning methods. Research findings indicate that the use of digital media can increase student engagement in the learning process. This aligns with constructivist learning theory, which emphasizes the importance of active student interaction in constructing knowledge through more interactive learning experiences.

In the context of Islamic education, the use of learning technology is also aimed at shaping students' character, enabling them to use digital media wisely, responsibly, and in accordance with Islamic values. Teachers serve not only as transmitters of learning materials but also as mentors in fostering ethical technology use in students.

Although digital learning offers numerous benefits, this study identified several major barriers to its implementation. Class teachers stated that limited internet connection was the biggest obstacle to implementing digital learning. Unstable internet connections often disrupted the learning process, thus hindering optimal use of digital media. Furthermore, some students lacked personal devices and had to alternately use their parents' devices.

Interviews with students revealed that limited internet access makes it difficult for them to fully participate in learning. Several students reported experiencing frequent signal interruptions when accessing Google Classroom or participating in lessons via Zoom. This situation leads to less than optimal student engagement.

The principal also stated that the school has made efforts to provide technological support to support digital learning. However, limited infrastructure within the school area remains a major challenge in implementing digital-based learning.

Interview Results with Classroom Teachers

Based on interviews conducted with classroom teachers, it was found that digital-based learning has been implemented through several accessible digital platforms.

“We use WhatsApp to communicate with parents and students, while Google Classroom is used to distribute learning materials and assignments. When possible, we also use Zoom for online face-to-face learning sessions.” (Mrs. Deka, the Classroom Teacher)

The teacher explained that digital technology facilitates the delivery of learning materials.

“Through digital media, learning materials can be shared more quickly, and students can review them at home whenever they need. This makes the learning process more flexible.” (Mrs. Deka, the Classroom Teacher)

However, the teacher also highlighted several challenges in implementing digital learning.

“The biggest obstacle is the unstable internet connection. In addition, not all students have their own smartphones, so they often have to share devices with their parents.” (Mrs. Deka, the Classroom Teacher)

Interview Results with Students

The interview results revealed that students perceived digital learning as beneficial because it provided easier access to learning materials.

“I can access the materials and assignments uploaded by the teacher through Google Classroom. If I do not understand something, I can review it again at home.” (Rio Paldo, Student)

Students also reported that learning videos increased their interest in learning activities.

“I enjoy learning more when the teacher uses videos because they are easier to understand and less boring.” (Fadli, Student)

Nevertheless, several students experienced difficulties due to limited internet access.

“Sometimes the internet signal at home is weak, so I submit assignments late or cannot participate in Zoom sessions until the end.” (Indah, Student)

Interview Results with the Principal

Based on the interview with the principal, it was found that the school has made efforts to support the implementation of digital learning through available policies and facilities.

“The school continuously encourages teachers to integrate technology into learning so that students can keep up with technological developments and improve the quality of education.” (Mrs. Alincia, the Principal)

The principal also stated that infrastructure limitations remain a major challenge.

“We strive to provide the necessary facilities; however, internet connectivity in both the school environment and students’ homes remains a significant challenge that has not yet been fully resolved.” (Mrs. Alincia, the Principal)

In addition, the principal emphasized the importance of character development in technology use.

“Technology should be used wisely. Therefore, teachers are not only responsible for delivering academic content but also for guiding students to use digital media ethically and in accordance with positive values.” (Mrs. Alincia, the Principal)

Table 1. Summary of Interview Results

Informant	Main Findings
Classroom Teacher	Digital learning is implemented through WhatsApp, Google Classroom, and Zoom. It facilitates the delivery of learning materials but is constrained by unstable internet connections and limited access to devices.
Students	Digital learning provides easier access to learning materials and increases learning interest through educational videos; however, limited internet access remains a major obstacle.
Principal	The school supports the implementation of digital learning, but technological infrastructure and internet connectivity limitations continue to pose significant challenges

The interview findings as shown at table 1 indicate that the implementation of digital-based learning at SD Negeri 02 Suka Merindu has enhanced learning flexibility and student engagement. However, its effectiveness is still influenced by limitations in technological infrastructure and internet accessibility.

Discussion

Based on observation notes and interviews with student, class teachers and the head of the madrasa, it is known that the implementation of digital-based learning at SD Negeri 02 Suka Merindu demonstrates the school's efforts to utilize technology to improve the quality of learning. The use of digital applications as shown at figure 2, such as WhatsApp, Google Classroom, and Zoom helps teachers create a more flexible and interactive learning process. This finding aligns with research by Salsabila et al., (2020). which states that digital technology functions as a supporting tool for learning activities and facilitates access to information. This was also revealed in his research by Lindawati & Rahman, (2020), which found that online learning provides learning flexibility and broadens the scope of student learning.



Figure 2. Digital-Based Learning Process at SD Negeri 02 Suka Merindu

The use of digital media has been proven to increase student motivation and engagement in the learning process. Students become more engaged in learning because the material is presented through videos, images, and other interactive media. This finding is supported by constructivist theory, which explains that students will understand material

more easily if they are actively involved in the learning process. Furthermore, research by Azhar & Wahyudi, (2024). also shows that interactive learning can increase students' intrinsic motivation to learn.

Based on interviews with students, class teachers, and the head of the madrasah also mentioned the implementation of digital learning in schools still faces various obstacles, particularly related to limited technological infrastructure. Poor internet network quality and limited digital devices are key factors hindering the effectiveness of digital learning. This finding aligns with research by Munir & Su'ada, (2024), which found that limited technological infrastructure is often a major obstacle to implementing digital learning in remote areas.

Limited digital devices mean that not all students can optimally participate in learning. Some students must share devices with other family members, limiting learning time. Furthermore, unstable internet connections often make it difficult for students to access learning materials. These issues demonstrate that the success of digital learning is heavily influenced by adequate technological infrastructure.

Research findings also indicate that teachers' digital competencies still need to be improved. Teachers have attempted to use digital learning media, but still face challenges in developing more innovative and effective learning materials. This highlights the importance of ongoing training for teachers in the use of learning technology. Research by Novelita et al., (2023) explains that improving teachers' digital competencies is crucial for creating effective learning that aligns with developments in educational technology.

Viewed through the lens of Islamic education, integrating technology into the learning process is intended to develop students' moral character just as much as it enhances their academic performance. It is essential that digital tools are applied prudently, with a strong emphasis on ethical integrity and responsible media consumption. Consequently, educators bear the vital responsibility of teaching digital etiquette, ensuring that students' technological engagement consistently reflects and upholds core Islamic principles.

Furthermore, parental involvement is also a crucial factor in the success of digital learning. Parents play a role in assisting students when using digital devices and helping overcome technical difficulties during learning. This finding is supported by research by (Ahmad et al., 2024), which states that collaboration between teachers and parents is crucial in supporting students' digital literacy.

This research highlights several vital prerequisites for implementing digital learning in Islamic elementary schools, notably adequate technological facilities, enhanced teacher competencies, and the reinforcement of Islamic teachings within digital practices. In this context, technology transcends its role as a mere tool for academic enhancement; it serves as

a foundational framework for character education, guiding students toward responsible and faith-aligned digital habits. Ultimately, overcoming infrastructural limitations necessitates a strong, strategic partnership between schools, parents, and government entities.

CONCLUSION

Digital learning has been implemented by utilizing various applications such as WhatsApp, Google Classroom, and Zoom. This implementation has had a positive impact on the learning process, particularly in increasing learning flexibility, facilitating access to learning materials, and enhancing students' motivation and engagement in learning. However, the success of digital learning implementation is still influenced by various supporting and inhibiting factors. Supporting factors include the school's commitment, teachers' willingness to utilize technology, and students' enthusiasm in participating in digital learning. Meanwhile, the main inhibiting factors are limited technological infrastructure, such as unstable internet connection, lack of digital devices owned by students, and teachers' digital competencies that still need improvement.

In addition, this study found that the integration of Islamic educational values in digital learning has been carried out through character building, ethics, and responsibility in the use of technology. This indicates that technology is not only used as a learning tool but also as a means of shaping students' morals in using digital media wisely and in accordance with Islamic values. Thus, it can be concluded that the implementation of digital-based learning at SD Negeri 02 Suka Merindu has been carried out, but it is not yet optimal due to limitations in infrastructure and resources. Therefore, improvements in technological facilities, strengthening teachers' digital competencies, and collaboration between schools, parents, and the government are needed so that digital learning can run more effectively and sustainably in areas with limited infrastructure.

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