MANAGERE: Indonesian Journal of Educational Management
Vol. 8 No. 2 (2026), p. 158-171
Available online at https://serambi.org/index.php/managere

Transforming Out-of-School Education: The Role of Teacher Digital Literacy in Enhancing Learning Quality

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DOI: https://doi.org/10.52627/managere.v8i2.2087

Article History:
Received: 08 January 2026
Revised: 29 April 2026
Accepted: 22 May 2026

Keywords:
Digital Assessment, Teacher Digital Literacy, Learning Quality, Suburban Schools

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Abstract :
This study aims to investigate the role of teachers' digital literacy in enhancing learning quality in primary schools, particularly in contexts with limited access to technology. Education in remote areas faces persistent structural challenges, including limited digital devices, unstable internet connectivity, and varying teacher readiness. Teacher digital literacy, encompassing the ability to select, adapt, and integrate technology into pedagogical practices, is critical for fostering inclusive and effective learning. A qualitative case study approach was employed, involving observations, interviews, desk reviews, and interview guides to capture teachers' experiences, strategies, and challenges in implementing digital literacy. Findings indicate that digitally literate teachers enhance learning processes through platforms such as Google Classroom and Zoom, strengthen communication and collaboration with students, and leverage objective evaluation data to design adaptive instructional strategies. Additionally, the use of digital learning resources fosters student motivation, autonomy, and engagement. The study recommends teacher professional development programs that emphasize integrating pedagogy and technology, alongside infrastructure improvements to support sustainable educational transformation.

INTRODUCTION

Education has become one of the most strategic instruments for improving social mobility, reducing inequality, and preparing communities to participate in an increasingly digital society. In Indonesia, the urgency of educational transformation is particularly evident in remote and out-of-school education contexts, where learners often lack equal access to qualified teachers, learning resources, and technological support. Digital technology offers significant opportunities to enrich teaching practices, expand access to learning materials, and strengthen teacher-student interaction. However, these opportunities can only produce meaningful educational change when teachers possess adequate digital literacy. Teacher digital literacy is not merely the ability to operate devices, but also the capacity to select, adapt, and integrate digital tools into pedagogical practices. Therefore, improving teachers' digital literacy is socially important because it can support more inclusive, adaptive, and equitable learning. In this sense, digital literacy becomes a key factor in transforming learning quality, especially for communities that conventional educational systems have historically underserved.

Despite the potential of technology, education in remote areas of Indonesia still faces persistent structural problems. Limited access to digital devices, unstable internet connectivity, inadequate electricity, and insufficient teacher training continue to affect

the quality of teaching and learning. Qodir & Choerudin (2024) and Timotheou et al. (2023) emphasize that schools in remote areas often experience technological limitations that directly influence the learning process. In the Indonesian context, (UNICEF, 2021; Mhlanga, 2024) reported that digital learning still faces serious challenges related to unequal access to devices, internet connectivity, teacher readiness, and the availability of relevant digital learning resources. In addition, the Central Statistics Agency reported that Statistics of Education 2020 presents national education indicators based on the March 2020 National Socio-Economic Survey and school registration data for the 2019/2020 academic year, which can be used to contextualize disparities in educational access and facilities in Indonesia (BPS, 2020). This problem is not only infrastructural but also pedagogical. Teachers may have devices or internet access, yet still struggle to transform them into meaningful learning media. As Kalyani (2024) and Ghalia & Karra (2023) argue, educational technology can enhance participation and learning, but its effectiveness depends on teachers' readiness and competence. Thus, the central problem is not simply whether technology exists, but whether teachers are digitally literate enough to use it contextually.

Previous studies have confirmed that teachers' digital literacy plays an important role in improving learning quality. Haq et al. (2023) and Carabregu-Vokshi et al. (2024) found that teachers with stronger digital skills are better able to use learning platforms to communicate with students, organize instructional materials, and create more interactive learning experiences. Muthmainnah et al. (2025) also reported that teachers' digital competence contributes to the effectiveness of teaching and learning, particularly when technology is used to support student engagement. At the global level, UNESCO (2023) highlights that technology in education can support access and innovation, but also warns that it may widen inequality if introduced without adequate governance, teacher preparation, and contextual adaptation. Similarly, Foster (2023) and Nguyen & Tuamsuk (2022) emphasizes that digital education requires not only infrastructure but also teacher professional development, standards, and a supportive digital ecosystem. However, much existing research still focuses on urban schools, ideal infrastructure, or general digital competence frameworks rather than the lived experiences of teachers in remote and out-of-school educational settings.

This gap is important because digital literacy in remote education cannot be understood in the same way as digital literacy in well-resourced schools. In urban contexts, digital literacy is often associated with the use of learning management systems, multimedia content, online assessments, or artificial intelligence-based learning support. In remote contexts, however, teachers often need to work with limited devices, unstable signals, shared smartphones, offline materials, and low-bandwidth communication platforms. Therefore, the meaning of digital literacy becomes more practical, adaptive, and problem-solving oriented. A teacher may be digitally literate not because they use sophisticated platforms, but because they can creatively adapt simple technologies to maintain student participation and learning continuity. This study offers novelty by shifting the discussion of teacher digital literacy from an ideal technological environment to a constrained educational reality. It positions teacher digital literacy as a contextual capability that enables teachers to transform limited digital resources into meaningful pedagogical strategies.

Based on this background, the research problem addressed in this study concerns how teachers' digital literacy enhances learning quality in out-of-school and remote educational contexts. The main argument of this study is that teacher digital literacy functions as a mediating capacity between limited technological access and improved

learning quality. In other words, technology alone does not automatically improve education; its impact depends on teachers' ability to use it pedagogically, creatively, and contextually. When teachers have adequate digital literacy, they are better able to design learning activities, communicate with students, select relevant digital content, and encourage student engagement despite infrastructural constraints. Conversely, when teachers lack digital competence, even available technology may remain underused or used only for administrative purposes. This argument contributes to the literature by emphasizing that learning quality in remote areas is shaped not only by infrastructure provision but also by teachers' professional agency and adaptive digital practices.

Therefore, this study aims to examine the role of teachers' digital literacy in improving the quality of learning in out-of-school education, particularly in remote areas with limited access to technology. Specifically, this research explores how teachers use digital tools in teaching, what challenges they face in integrating technology, and how digital literacy influences student participation and learning achievement. A qualitative approach is used to capture teachers' experiences, strategies, constraints, and contextual adaptations in real educational settings. The findings are expected to provide theoretical and practical contributions. Theoretically, this study enriches the discussion of digital literacy by situating it within the realities of educational inequality and remote learning. In practice, the study can inform educational policymakers, school leaders, and teacher-training institutions in designing more relevant digital competency programs. Thus, this research is expected to support more equitable, contextual, and sustainable transformation of learning quality in underserved educational communities.

RESEARCH METHODS

This research was designed as a qualitative case study. The purpose of this case study was to examine the phenomenon of digital literacy among teachers at SDN Pakuniran 1 and its impact on learning quality (Miller et al., 2023; Mtisi, 2022). This case study was also chosen because it allowed researchers to conduct a more in-depth analysis of the specific conditions in a remote school and to gain an understanding of the social, cultural, and technological contexts that influence the implementation of digital literacy. A better understanding of the processes and challenges teachers face when implementing digital literacy in the classroom can be gained through a qualitative approach.

Pakuniran 1 Elementary School, located in a remote area, is the unit of analysis for this study. This location was chosen because it represents educational conditions in areas with limited access to technology and digital resources. The case study will examine how teachers' digital literacy affects the quality of learning at this school. The focus of this research is on teachers' learning activities and digital literacy development or training programs. Therefore, the research material objects include the school institution, learning activities, and relevant digital literacy programs.

Table 1. Research Informants

Informant	Education		Gender		Amount
	Elementry School	S1	L	P	
Headmaster		1	1		1
Classroom teacher		2	1	1	2
Subject Teacher		2	2		2
Operator		1	1		1
Student	6		2	4	6

Four main methods were used to collect data in this study: desk review, observation, interviews, and an interview guide (Almusaed et al., 2025; Mbanaso et al., 2023). The desk review was used to gather information on policy documents, training programs, and the school's existing digital literacy programs. To directly observe how teachers at SDN Pakuniran 1 use digital literacy in their daily learning processes, in-depth interviews were conducted with teachers and other informants. The purpose of these interviews was to understand students' perceptions, experiences, and challenges in improving their digital literacy. The interview guide was created to ensure that questions were relevant to the research subjects and could gather the necessary information.

The Miles and Huberman data analysis model will be used to analyze the collected data. This model consists of three main stages: data reduction, data display, and data verification (Monaro et al., 2022; Nasir & Sukmawati, 2023). The first stage involves preparing the data in a systematic, easily understandable format, such as a table or diagram. In the second stage, the data will be displayed to filter for relevant information and group it by emerging themes. Therefore, this data analysis will provide a clear picture of teachers' digital literacy and its impact on learning quality at SDN Pakuniran 1.

RESULTS AND DISCUSSION

Results

The Use of Technology in the Nature of the Learning Process

The use of technology in the teaching and learning process is increasing, especially due to the pandemic, which has forced many educational institutions to switch to online learning. One teacher said that technology helps simplify the teaching and learning process, especially by providing broader, more interactive access to materials. "By using platforms like Google Classroom or Zoom, we can deliver material directly and better facilitate discussions between students." This allows students to participate more actively and is not limited by space and time.

Although technology offers many conveniences, problems also arise when it is applied. A school principal said that not all students have sufficient access to devices or a stable internet connection. "Some students have difficulty following online lessons due to technological issues, such as weak internet connections or inadequate devices," he said. This shows the disparity in access to technology that needs to be addressed so that all students can experience its benefits in learning. On the other hand, the use of technology also positively impacts the quality of learning. A student who frequently uses digital learning applications said that technology makes the subject matter more interesting and easier to understand. "For example, by using applications like Quizlet or Kahoot, we can learn in a more fun and less boring way." Technology also enables learning through games, increasing students' enthusiasm and motivation.

The informant stated that the use of technology in the learning process has shown significant improvement, particularly in response to changes in the learning system brought about by the pandemic. Technology plays a crucial role in facilitating the teaching and learning process by providing broader access to materials and more flexible interactions between educators and students. The use of various online learning platforms enables students to more actively participate in discussions and learning activities without being limited by space or time, thereby facilitating a more effective learning process. However, implementing technology also faces obstacles, including limited access to devices and a stable internet connection, which means not all students

can participate optimally in learning and creates gaps in technology utilization. On the other hand, the use of technology has been proven to improve learning quality, as materials can be presented in a more engaging, interactive, and easy-to-understand manner through various digital learning applications, including game-based ones, thereby increasing students' motivation and enthusiasm for learning. Overall, technology has made a positive contribution to improving the effectiveness and quality of learning, though efforts remain needed to overcome barriers to access and equitable use.

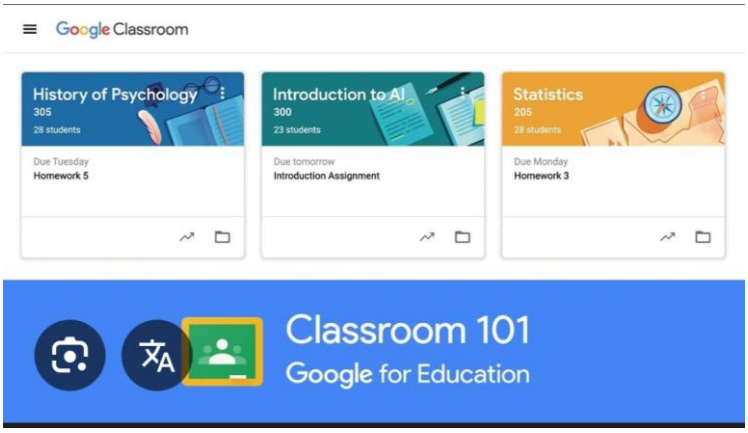

Figure 1. Classroom application image

Based on the image above, it is clear that technology has been used in the learning process through the Google Classroom platform as a digital learning medium. The virtual classroom display, which contains lesson materials, student numbers, and assignment information, demonstrates that technology is being used to manage learning in an orderly and systematic manner. With Google Classroom, teachers can share materials, assign assignments, and clearly define deadlines, while students can access learning materials anytime and anywhere. This demonstrates that technology serves as a learning aid, simplifying classroom management, enhancing communication between teachers and students, and supporting more flexible, organized learning. These findings demonstrate that the use of digital technology can enhance the effectiveness of the learning process and is an important part of efforts to improve learning quality.

Overall, results indicate that technology has been actively used in teaching and learning, particularly in response to changes in the learning system brought about by the pandemic. This aims to facilitate the delivery of materials, expand access to learning, and enhance interaction between teachers and students through platforms such as Google Classroom and Zoom. The use of technology enables more flexible learning without being limited by time or location, thereby encouraging active student participation in learning activities. However, the implementation of technology still faces obstacles, namely limited access to devices and a stable internet connection, so that not all students can participate optimally in learning, and there is a gap in the use of educational technology. Despite these challenges, technology continues to have a positive impact on learning quality, as material can be presented in a more engaging, interactive, and easy-to-understand manner through digital learning applications, including game-based ones, thereby increasing student motivation and enthusiasm for learning. Based on Google Classroom records, technology also helps manage learning in a structured, systematic manner, allowing teachers to organize materials, assignments, and submission times clearly. At the same time, students can access learning anytime, anywhere. Thus, overall,

technology has made a positive contribution to improving the effectiveness and quality of learning, although efforts are needed to expand access.

Effective Collaboration and Communication with Students

The study's findings indicate that effective collaboration and communication between teachers and students are crucial to improving learning quality, particularly in schools in remote areas. The use of digital technology is a key tool for fostering interaction between teachers and students, enabling faster, more flexible communication. These findings demonstrate that teachers' ability to utilize digital technology not only aids in delivering course material but also enhances the learning process through discussions, Q&A sessions, and group work. Digital collaboration encourages students to participate more enthusiastically in learning, boosting their motivation to solve problems, share ideas, and complete assignments together. Therefore, teachers' ability to use digital technology is a key factor in fostering effective communication and more active learning, thereby enhancing the learning process and improving the quality of learning in remote schools.

Based on research findings, teachers use digital platforms such as Google Classroom, Zoom, and WhatsApp to communicate and collaborate with students. Teachers reported that through these platforms, they can share learning materials, assign assignments, and respond directly to student questions. Students stated that they feel more comfortable asking questions and discussing them through digital platforms than interacting in person. Documentation in the form of Google Classroom screenshots shows a busy virtual classroom, with learning materials, student comments, and an organized to-do list. Observations of distance learning activities revealed effective group discussions and quick teacher responses to student questions. This data demonstrates that technology helps build two-way communication and ensures students remain active in learning even when they are not meeting in person.

The data presented show that technology plays a key role in connecting teachers and students, enabling more organized and responsive interactions. Although some students still face challenges accessing devices and internet connections, overall, the use of digital technology creates more intensive, two-way communication. Teachers can monitor student progress, provide faster feedback, and facilitate more effective discussions. However, the data also shows uneven student participation due to differences in access to technology. Nevertheless, interactions through digital media increase student engagement and facilitate collaboration. This demonstrates that technology not only facilitates communication but also strengthens the learning process and student engagement, indicating that teachers' effective use of digital literacy enhances the quality of learning.

The use of digital technology encourages more active and responsive collaboration and communication between teachers and students. Students are typically more active when allowed to discuss online, while teachers can provide appropriate guidance and feedback more quickly. There is also an increase in group interaction, with the use of comments, chat, and digital quizzes to support the learning process. These findings demonstrate that teachers' ability to use digital technology is crucial for creating clear, organized, and flexible interactions. Overall, the data show that technology-based collaboration and communication not only increase student engagement but also positively impact the quality of the teaching and learning process and improve learning in schools in remote areas.

Use of Objective Learning Evaluation Data

The use of objective learning evaluation data is an important way for teachers to improve learning quality, especially in remote schools. Teachers' ability to use digital technology is crucial for collecting, processing, and using evaluation data in a structured manner. Data collected through digital media or learning applications allows teachers to clearly understand students' learning progress, difficulties encountered, and areas for improvement. The results of this study indicate that objective evaluation is not only used to measure learning outcomes but also serves as a basis for teachers to design more appropriate learning methods. By regularly using evaluation data, teachers can monitor individual student progress, provide appropriate feedback, and recognize students' diverse learning needs, resulting in more effective learning and higher-quality learning outcomes.

Evidence was obtained from visual archives, including screenshots from the online learning system, which neatly summarise student assignments, quizzes, and exams. This display shows each student's achievement, comparisons between participants, and their level of mastery of the material. A feedback space is also visible, which educators use to explain students' strengths and errors. Furthermore, students are grouped by their level of understanding, enabling more targeted follow-up learning. These findings demonstrate that the use of digital tools helps make the assessment process more open, measurable, and accessible, while also supporting teachers in continuously monitoring learning progress and making informed decisions.

Student learning progress can be clearly mapped, making it easier for educators to identify who needs additional support, which material needs further study, and which error patterns occur most frequently. Although the information presentation appears systematic, teachers still need to be skilled at interpreting developmental trends, assessing achievement differences, and determining appropriate next steps. Challenges arise when significant gaps in results exist, necessitating prioritization based on each student's individual needs. In general, the use of technology-based tools supports transparency in assessments, facilitates monitoring of the learning process, and facilitates more targeted lesson planning.

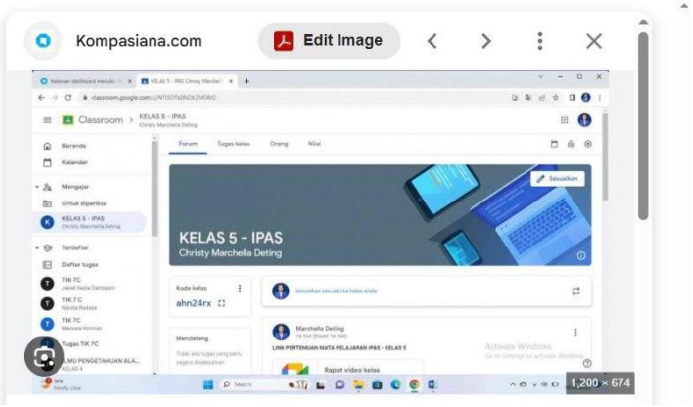

Figure 2. The teacher is opening the Google Classroom dashboard

Figure 2 shows a screen from the Google Classroom platform used to teach science to fifth-grade students. The teacher uses this platform to manage and evaluate learning digitally. This digital classroom display demonstrates that the teacher regularly and clearly uses technology to collect, store, and monitor student learning outcomes. Teachers can view data through well-documented assignments, quizzes, and learning activities. The available data also allows teachers to see each student's learning progress,

both individually and overall, identify student ability levels, and identify students who need additional support. Thus, this image demonstrates that the use of technology in evaluation helps produce more objective, transparent, and data-driven assessments and assists teachers in making appropriate learning decisions to improve student learning outcomes.

Therefore, teachers are increasingly using data-driven approaches to map students' abilities systematically. Students with high, medium, and low scores can be easily identified, allowing teachers to tailor learning strategies to each group. Another trend is the use of personalized, constructive feedback, which helps students understand their mistakes and improve their performance. These findings demonstrate that teachers' digital literacy supports the objective use of evaluation data, improves the accuracy of learning outcome measurements, and encourages a more adaptive learning process. Overall, the use of objective evaluation data shapes evidence-based decision-making, improves learning planning, and enhances the quality of learning in rural schools.

Utilization of Digital Resources for Students

Teachers' use of digital resources is a crucial strategy for improving learning quality in schools in remote areas. Teachers' digital literacy skills enable them to provide a variety of learning materials, educational applications, videos, and other online learning resources that students can access independently. This study demonstrates that, by using digital resources, teachers not only deliver material traditionally but also provide opportunities for students to learn more flexibly, deeply, and at their own pace. Students can explore additional content that helps deepen their understanding, strengthen their independent learning skills, and increase their enthusiasm for learning. Thus, teachers' digital skills have been shown to play a role in creating a more flexible, interactive, and creative learning process, ultimately improving the quality of learning and student outcomes in remote schools.

The evidence obtained demonstrates how teachers use digital resources. Examples include screenshots from online learning platforms, learning video repositories, and interactive educational applications. The documentation displays lists of learning materials, explanatory videos, quizzes, and references that students can access at any time. Furthermore, automatic commenting and grading features allow teachers to provide direct feedback to students. The documentation also shows how teachers group learning resources by topic or difficulty level, making it easier for students to select materials that meet their needs. The documentation also records student activities, such as accessing digital learning modules, taking interactive quizzes, and participating in online forums. The results of this study indicate that digital resources are used in an organized manner to support effective learning and help students develop independent learning skills.

Based on available resources, it appears that using digital resources helps teachers develop structured materials and increases active student participation. Data show that teachers can group learning materials by topic, provide easy access, and monitor student learning progress. However, challenges arise when students differ in their ability to use digital resources or experience limited device and internet access. Nevertheless, the photos also show that most students actively use digital materials, taking quizzes, watching learning videos, and participating in forum discussions. This demonstrates that digital resources not only complement learning but also serve as

interactive tools that encourage students to learn more independently, thus helping teachers identify learning difficulties and provide more appropriate guidance.

Figure 3. Revealing the impact of digital resources in remote schools

Figure 3 demonstrates the critical importance of teachers in remote schools using digital technology to produce clear, objective learning evaluation data. Digital technology enables the measurable collection and analysis of student learning outcomes through online quizzes, digital assignments, and learning activity logs, ensuring that assessments are not based solely on personal opinion. This evaluation data helps improve learning quality by providing a clear picture of student progress, encouraging enthusiasm for learning through monitoring participation, and enabling a streamlined assessment process, even under location constraints. Furthermore, objective data also highlights challenges, such as inadequate infrastructure and digital proficiency, enabling more targeted solutions. This data also forms the basis for developing data-driven learning evaluations, a future trend in education.

The increasing trend in the use of digital resources to support more flexible and independent learning. Students are more likely to explore additional materials, take interactive quizzes, and engage in discussions on online platforms when digital resources are organized. Teachers also use student interaction data on digital platforms to monitor learning progress and adapt teaching methods to suit individual student needs. The results of this study indicate that teachers' ability to use digital technology is crucial for creating more adaptive learning experiences, increasing access to learning materials, and building students' enthusiasm and learning ability. Overall, learning utilizing digital resources demonstrates a more proactive, creative, and structured approach, contributing to improved learning quality in schools in remote areas.

Discussion

The findings of this study indicate that teachers' digital literacy plays an important role in improving the quality of learning in rural schools, particularly through the use of digital platforms such as Google Classroom, Zoom, Quizlet, Kahoot, and other online learning applications (Rajah & Rasiah, 2024; Oksana et al., 2022). Teachers used these platforms to deliver materials, manage assignments, organize virtual classrooms, and create more flexible learning interactions. Academically, this finding suggests that digital literacy should not be understood merely as the technical ability to operate devices, but as pedagogical competence that enables teachers to transform technology into

meaningful learning strategies. This is consistent with the TPACK framework, which emphasizes integrating technological, pedagogical, and content knowledge for effective teaching practices (Technology and Content 2024). The finding also supports Afonso et al. (2025) and Huda (2024), who argue that digital learning tools can increase flexibility, engagement, and access to learning materials. However, unlike studies conducted in more technologically supported contexts, this study shows that the benefits of digital learning in rural schools remain strongly influenced by unequal access to devices and internet connectivity. Therefore, the contribution of this study lies in showing that teacher digital literacy becomes most significant when teachers are required to adapt limited technological resources to maintain learning quality.

The study also found that digital technology strengthens communication and collaboration between teachers and students. Platforms such as WhatsApp, Zoom, and Google Classroom, with comment features enabled, allowed teachers to respond to questions, guide discussions, provide feedback, and maintain student participation even when face-to-face interaction was limited. This finding can be interpreted through the Community of Inquiry perspective, which explains that meaningful online learning is built through teaching presence, social presence, and cognitive presence. Wang et al. (2021) similarly emphasize that teacher presence and social interaction are essential in creating effective online learning environments. In line with this, recent studies on online learning engagement show that interaction, communication, and teacher facilitation are closely related to students' behavioral and cognitive engagement. The findings of this study confirm that digital communication is not only a supporting tool but also a medium for building learning relationships. However, this study also differs from some prior research because communication in rural schools is not always smooth or equal; students with limited devices or unstable internet access may participate less actively. Thus, the theoretical contribution of this finding is that digital collaboration in rural education must be understood as both an opportunity and an equity challenge.

Another important finding is that teachers used digital systems to support more objective learning evaluation. Through digital assignments, quizzes, learning dashboards, feedback columns, and documented student activities, teachers could monitor students' progress more systematically. This finding supports Hidayat et al. (2024), who highlight the role of digital assessment in helping teachers organize assignments, record learning outcomes, and provide more structured evaluation. It is also consistent with Rejekiningsih & Hidayatulloh (2025), who argue that learning management systems can improve assessment transparency and support remediation or enrichment based on student needs. From an academic perspective, this finding shows that teachers' digital literacy is closely connected to data-driven decision-making in education. Digitally literate teachers are not only able to deliver content but also able to read learning evidence, identify student difficulties, and design follow-up instruction. Nevertheless, this study also shows that digital data are useful only when teachers can interpret them pedagogically. Without such competence, evaluation data may remain administrative records rather than instruments for improving learning quality.

The findings further reveal that teachers' use of digital resources helps students access learning materials more flexibly and independently. Teachers provided learning videos, digital modules, interactive quizzes, online references, and discussion forums to support students' understanding beyond conventional classroom instruction. This finding is consistent with (Christopoulos & Sprangers, 2021; Gonsalves & Lin, 2025), who explain

that the pandemic accelerated the use of digital learning environments and encouraged teachers to adopt technology as part of instructional practice. It also aligns with (Kendall et al., 2022; Tacanho, 2025), who emphasize that the effectiveness of educational technology depends on local context, family support, school readiness, and students' access to digital resources. In this study, digital resources contributed to student motivation, independent learning, and a wider range of learning experiences. However, the findings also show that digital resources do not automatically guarantee equal learning outcomes, as students differ in their digital skills, device access, and internet stability. Therefore, this study contributes to the literature by emphasizing that the use of digital resources in rural education should be understood as a contextual and adaptive practice, rather than a simple transfer of urban digital learning models to remote schools.

Overall, the discussion of these findings demonstrates that teacher digital literacy contributes to learning quality through four interconnected mechanisms: improving the learning process, strengthening communication and collaboration, supporting objective evaluation, and expanding access to digital learning resources (Gkoutis et al., 2025; Hidayatulloh et al., 2025). These mechanisms confirm that the quality of learning in rural schools is not determined solely by the availability of technology but also by teachers' ability to use it critically, creatively, and pedagogically. This study supports Wiedbusch et al. (2021), who argue that teachers play a central role as facilitators in technology-supported learning, and Ersoy (2023), who emphasizes the importance of digital interaction in maintaining learning continuity. Theoretically, this study enriches the literature on teacher digital literacy by showing that contextual constraints strongly shape digital competence in rural schools. In practice, the findings imply that teacher training programs should focus not only on technical skills but also on pedagogical design, digital communication, data interpretation, and the creation of low-bandwidth learning resources. For policymakers, the findings indicate the need to combine infrastructure improvements with continuous teacher professional development to ensure that digital transformation genuinely improves learning quality in remote and out-of-school education contexts.

CONCLUSION

The study highlights that teacher digital literacy is pivotal in enhancing the quality of learning in primary schools with limited technological resources, demonstrating that educators who effectively integrate digital tools can improve instructional processes, student engagement, and data-driven decision-making. The key insight is that technology alone is insufficient; meaningful educational outcomes rely on teachers' pedagogical competence and adaptive use of digital resources. This research contributes to the academic discourse by emphasizing the contextual and practical dimensions of digital literacy and by extending theoretical frameworks beyond idealized technological environments into real-world, resource-constrained settings. However, the study is limited by its focus on a single school case, which may restrict generalizability. Future research could compare multiple primary schools, investigate the long-term impacts of digital literacy on student achievement, and examine strategies to mitigate inequities in device and connectivity access, thereby informing more comprehensive policies and

professional development programs for digitally empowered teaching across diverse educational contexts.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the Headmaster, teachers, students, and school staff of SDN Pakuniran 1 for their valuable participation and support throughout this study. Appreciation is also extended to colleagues and reviewers whose insights contributed to the completion of this research on teacher digital literacy and learning quality in remote educational contexts.

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