Journal of Primary Education
14 (2) (2025) :58 –72

https://journal.unnes.ac.id/sju/index.php/jpe

Teachers' Perceptions of the Utilization of Smartboard Media in Sixth Grade Classrooms at SD Negeri Serang 02

Muhamad Sanusi [1]✉, Ajo Sutarjo [2], Fatihaturosyidah[2]

Universitas Pendidikan Indonesia, Indonesia

Article Info

History Articles
Received:
10 Oktober 2025
Accepted:
20 November 2025
Published:
30 Desember 2025

Keywords:
digital learning media, educational technology, elementary school, smartboard, teacher perception

Abstract

The integration of digital technology into education has encouraged the use of smartboards as an interactive digital learning medium. The successful implementation of smartboard depends not only on the availability of technological facilities but also on teachers' perceptions as the primary users in the learning process. This study aimed to describe sixth-grade teachers' perceptions of smartboard utilization in classroom instruction and to identify the challenges and strategies employed to optimize its use at SD Negeri Serang 02. This research employed a descriptive qualitative approach involving four sixth-grade teachers and one vice principal for curriculum affairs selected through purposive sampling. Data was collected through semi-structured interviews, classroom observations, and document analysis. The data were analyzed through data organization, coding, categorization, interpretation, and credibility testing using triangulation and member checking. The findings revealed that teachers had positive perceptions of smartboard utilization, reflected in their understanding of its functions, experiences integrating it into various stages of instruction, and evaluation that it facilitated content delivery while increasing student engagement. The identified challenges included the limited number of smartboard units, unstable internet connectivity, and classroom management when students used the device alternately. Optimization was supported through school policies, instructional planning, professional teacher development, and collaboration among teachers. The findings indicate that successful smartboard utilization is influenced by teachers' perceptions, institutional support, and teachers' ability to adapt instructional strategies to students' learning needs.

✉ Correspondence address:
E-mail: muhamadsanusi@upi.edu

p-ISSN 2252-6404
e-ISSN 2502-4515

INTRODUCTION

Digital transformation has triggered shifts in various aspects of education, including the ways teachers design and implement learning in elementary schools. The use of technology is no longer viewed merely as a medium for delivering instructional materials; rather, it is now recognized as a learning strategy to improve the quality of the learning process while supporting the development of students' 4C skills, namely critical thinking, creativity, communication, and collaboration (Chusna et al., 2024).

The availability of technology-based learning media enables teachers to deliver instructional content in more diverse ways, making the learning process more engaging, encouraging classroom interaction, and accommodating the learning needs and characteristics of elementary school students (Agustina, 2024). Presenting instructional materials through various digital elements, such as visuals, audio, videos, animations, and interactive features, enriches students' learning experiences. This approach is considered more effective in facilitating students' understanding of learning materials than conventional instructional media (Firmansyah et al., 2024). In this study, interactive learning is defined as a learning process that provides students with opportunities to actively participate through interactions with teachers, peers, and digital learning media during classroom activities (Suhirman et al., 2025).

Smartboards are interactive digital learning media that have increasingly been adopted in elementary schools as part of technology integration to support the learning process. This technology enables teachers and students to interact directly with instructional materials through a touchscreen integrated with various digital learning resources, including text, images, audio, videos, animations, and educational applications. Presenting instructional materials through media that combines visual displays with interactive features helps teachers explain learning concepts more clearly. Consequently, students can understand previously abstract concepts more easily because they are presented through more engaging learning experiences (Winayu, 2024). The use of smartboards also provides opportunities for students to actively participate in various learning activities, such as discussions, digital quizzes, simulations, and educational games that enhance their engagement throughout the learning process. This practice is consistent with the implementation of the Merdeka Curriculum, which encourages the use of technology to create student-centered learning. Several studies have reported that smartboard implementation benefits classroom instruction. The presence of this technology helps teachers deliver learning materials more clearly, increases students' learning motivation, and promotes their engagement in classroom activities (Belinda et al., 2023; Sembiring & Kona, 2024; Wang et al., 2023). These findings indicate that smartboards serve functions beyond those of conventional presentation tools. Their use as interactive digital learning media can support student engagement and create more meaningful learning experiences.

Preliminary observations conducted at SD Negeri Serang 02 on January 21, 2026, revealed that the school had implemented smartboards as one of its digital learning media for sixth-grade instruction. The technology has helped teachers present instructional materials through various visual formats, including images, videos, and animations. However, the interactive features of the smartboard have not yet been fully utilized, resulting in its predominant use as a presentation medium rather than as an instructional tool that actively engages students. This condition indicates that the availability of technological facilities does not automatically lead to optimal learning outcomes, as successful implementation also depends on teachers' readiness to integrate technology into the instructional process. This finding is consistent with Alindra et al (2025), who argued that the successful implementation of educational technology is influenced by teachers' readiness to utilize technology according to instructional needs.

Numerous studies have shown that smartboard use enhances students' learning motivation, conceptual understanding, and engagement through more attractive and interactive instructional delivery (Azzahra et al., 2025; Jandri et al., 2025). These findings demonstrate the effectiveness of smartboards as interactive digital learning media. However, most previous studies have primarily focused on the impact of smartboard use on students and have not sufficiently explained the mechanisms through which teachers' perceptions shape the implementation of smartboards in elementary school classrooms. These findings suggest that the successful implementation of classroom technology depends on more than the characteristics of the learning media itself. The ways teachers plan, utilize, and manage technology during instruction also play a crucial role in determining its successful implementation.

Studies on teachers' perceptions of educational technology have been conducted in various contexts. Saputra et al., (2022) found that teachers responded positively to the use of augmented reality because it enhanced students' learning motivation. Similarly, Kournikova et al. (2025) reported that teachers generally held positive perceptions of information and communication technology, believing that it made the teaching and learning process more effective. Nevertheless, these studies did not specifically explain how teachers' perceptions shape the implementation of smartboards as interactive digital learning media, including the challenges encountered and the strategies employed during elementary school instruction. This gap constitutes the primary focus of the present study.

Differences in the quality of smartboard implementation among schools with similar technological facilities indicate that the successful integration of technology is influenced not only by the availability of equipment but also by teachers' perceptions of the technology itself. In this study, teachers' perceptions are defined as the ways teachers understand, evaluate, and interpret the use of smartboards as interactive digital learning media. These perceptions are reflected in teachers' evaluations of the usefulness, ease of use, and suitability of smartboards for classroom instruction. Meanwhile, the challenges and strategies associated with smartboard use are conceptualized as the actions taken by teachers to optimize its implementation, whereas perception refers to how teachers assess and interpret smartboard use. This distinction is important because teachers' perceptions may explain why smartboard implementation results in different levels of instructional quality despite similar technological facilities (Hidayah & Fauziah, 2025; Rahayu & Makmur, 2024).

This study contributes to the field of educational technology by explaining how teachers' perceptions influence the implementation of smartboards in elementary school learning. The findings are expected to broaden the understanding that successful smartboard implementation depends not only on the availability of technological facilities but also on how teachers perceive and integrate technology into classroom instruction. Furthermore, the findings are expected to provide a foundation for schools in designing teacher professional development programs, improving smartboard utilization, and supporting policy development related to the sustainable integration of educational technology (Pangkey & Gampu, 2025).

This study aims to describe sixth-grade teachers' perceptions of smartboard utilization in classroom instruction while identifying the challenges they encounter and the strategies, they employ to optimize its use. These objectives are based on the importance of instructional technology, which has been shown to improve students' understanding and engagement in learning (P. R. Aini et al., 2024).. Overall, this study is expected to contribute theoretically to the advancement of educational technology research and practically by providing a basis for schools to improve the effectiveness of smartboard implementation through institutional policies and teacher professional development programs (Hidayah & Fauziah, 2025).

METHOD

This study employed a descriptive qualitative approach based on the constructivist paradigm. This approach was selected because the purpose of the study was to explore teachers' perceptions of smartboard utilization based on their experiences during classroom instruction. Within the constructivist paradigm, understanding a phenomenon is constructed through participants' experiences and the ways they interpret those experiences, making both the primary sources of data collection (Creswell & Poth, 2025). Through this approach, the researchers were able to obtain an in-depth understanding of teachers' perceptions, the challenges they encountered, and the strategies they employed to optimize smartboard utilization in the classroom.

The research participants consisted of four sixth-grade teachers and one vice principal for curriculum affairs at SD Negeri Serang 02, who were selected using purposive sampling. Participants were selected based on the following criteria: actively teaching sixth-grade classes, having experience using smartboards in classroom instruction, being directly involved in smartboard implementation, and being willing to participate in the study. Sixth-grade teachers were chosen because they are responsible for instructional activities with more complex academic demands, resulting in more intensive smartboard utilization than in other grade levels. Information regarding school policies and institutional support for smartboard implementation was obtained through an interview with the vice principal for curriculum affairs (Creswell & Poth, 2025).

Three data collection techniques were employed in this study: observation, semi-structured interviews, and documentation. Observations were conducted to examine directly how smartboards were utilized during classroom instruction. Semi-structured interviews were then conducted to obtain in-depth information regarding teachers' perceptions, experiences, and views on smartboard utilization. Documentation served as supporting data, including photographs of classroom activities, instructional materials, and other documents related to smartboard use. The combination of these three techniques was intended to obtain more comprehensive data and provide a holistic understanding of the research phenomenon (Sugiyono, 2024).

The research instruments were developed based on the study objectives, which focused on teachers' perceptions of smartboard utilization, as well as the challenges and strategies associated with optimizing its use. The details of the research aspects, indicators, and data collection techniques are presented in Table 1.

Table 1. Research Instrument

Research Aspect	Indicators	Data Collection Techniques
Teachers' perceptions of smartboard utilization in classroom instruction	1. Teachers' understanding of the function of smartboards as learning media. 2. Teachers' experiences using smartboards at various stages of the learning process. 3. Teachers' evaluation of the benefits and impacts of smartboard use in classroom instruction.	Interviews, documentation, and observations.
Challenges in smartboard utilization	1. Technical challenges in smartboard utilization	Interviews, documentation, and observations.

	(limitations of equipment and internet connectivity). 2. Pedagogical challenges in managing classroom instruction using smartboards.	
Teachers' strategies for optimizing smartboard utilization	1. School support for smartboard utilization. 2. Instructional planning using smartboards. 3. Teachers' competency development through self-directed learning and collaboration with fellow teachers.	Interviews, documentation, and observations.

Data were analyzed using descriptive qualitative analysis following the analytical procedures proposed by Creswell & Poth (2025). The analysis began with transcribing all interview recordings, after which the researchers reviewed the transcripts repeatedly to gain a comprehensive understanding of the experiences and meanings conveyed by each participant. The researchers then conducted an open coding process by assigning codes to statements with similar meanings. Related codes were subsequently grouped into categories based on the research focus, namely teachers' perceptions of smartboard utilization, the challenges encountered, and the strategies employed to optimize its use. After the categories had been established, the researchers interpreted the relationships among the categories to gain a deeper understanding of how teachers perceived and interpreted smartboard utilization in classroom instruction. The findings were then verified through methodological triangulation by comparing data obtained from interviews, observations, and documentation. The interpretations were further confirmed through member checking with the participants to ensure that the findings accurately reflected the meanings and experiences they had shared.

RESULTS AND DISCUSSION

Teachers' Perceptions of Smartboard Utilization in Classroom Instruction

Based on the interview findings, all participants perceived the smartboard as an interactive digital learning medium that facilitates the delivery of instructional materials through various features, such as images, videos, animations, presentations, and educational games. The teachers explained that the use of smartboards helped them present learning materials that had previously been difficult to explain in a more concrete manner, making them easier for students to understand than when using conventional whiteboards. This perception was consistent with the classroom observations conducted during the Natural and Social Sciences (IPAS) lesson on the Solar System, which showed that the teacher used the smartboard to present slides, videos, animations, and simulations of celestial body movements throughout the lesson. The use of the smartboard during instructional delivery is illustrated in Figure 1, demonstrating that the technology was used as the primary medium for explaining the learning materials to students.

Figure 1. Classroom Instruction on the Solar System Topic

Documentation of the lesson module also indicated that smartboard utilization had been planned during the instructional design stage through the selection of learning media, teaching methods, and learning activities aligned with the learning objectives, as presented in Table 2.

Tabel 2. Lesson Module Document for the Solar System Unit (Natural and Social Sciences/IPAS)

Learning Outcomes	Learning Objectives
Explain the concept of the Solar System as part of the universe.	Students are able to explain the concept of the Solar System as part of the universe.
Identify the members of the Solar System, including the Sun, planets, satellites, asteroids, and comets, along with their characteristics	Students are able to identify the members of the Solar System, including the Sun, planets, satellites, asteroids, and comets, along with their characteristics.
Distinguish the characteristics of the inner and outer planets in the Solar System.	Students are able to distinguish the characteristics of the inner and outer planets in the Solar System.
Explain the Earth's rotation and revolution, as well as the movements of other celestial bodies within the Solar System.	Students are able to explain the Earth's rotation and revolution, as well as the movements of other celestial bodies within the Solar System.
Analyze the effects of the Earth's rotation and revolution on life on Earth, including the occurrence of day and night, seasonal changes, and eclipses.	Students are able to explain the effects of the Earth's rotation and revolution on life on Earth, including the occurrence of day and night, seasonal changes, and eclipses.

The consistency among the interview findings, classroom observations, and lesson module documentation demonstrates that the teachers' understanding of smartboard utilization was not only expressed during the interviews but was also reflected in both instructional practice and lesson planning conducted prior to classroom implementation.

The participants' experiences indicated that smartboards had been utilized throughout various stages of classroom instruction, including introductory activities, content delivery, group

discussions, educational games, and learning assessment. The teachers explained that each feature was used according to the characteristics of the instructional content, indicating that smartboard utilization extended beyond presentation purposes. Classroom observations showed that teachers were able to operate various smartboard features effectively during instruction, such as displaying videos, navigating presentation slides, playing animations, and managing digital quizzes without disrupting the learning process. Documentation of the instructional materials further demonstrated that smartboard use had been integrated into the sequence of learning activities described in the lesson modules, ensuring that each instructional stage was designed according to the learning objectives and content requirements. The interview, observation, and documentation findings consistently showed that smartboards had been utilized throughout all stages of classroom instruction, from the introductory phase to assessment activities. The consistency across these three data sources strengthens the findings regarding teachers' experiences in using smartboards during the learning process.

All participants expressed positive perceptions of smartboard utilization in classroom instruction. The teachers stated that smartboards helped create a more engaging learning environment because instructional materials could be presented through various visual formats and interactive activities that were difficult to implement using conventional whiteboards. These perceptions were reinforced by classroom observations, which showed that students actively participated when teachers incorporated educational games and digital quizzes into the lesson. Students' direct engagement with the smartboard is documented in Figure 2, which illustrates students taking turns operating the smartboard while participating in classroom learning activities

.

Figure 2. Students Completing a Solar System Quiz Using the Smartboard

The lesson module documentation also demonstrated that these activities had been planned in advance as part of an instructional strategy designed to increase student participation. The consistency among the interview findings, classroom observations, and documentation indicates that the benefits of smartboard utilization were experienced not only by teachers in delivering instructional materials but were also reflected in students' active engagement throughout the learning process.

Teachers' perceptions of the impact of smartboard utilization indicated noticeable changes in classroom instruction. The participants believed that smartboard use encouraged more active classroom interaction,

facilitated the delivery of instructional materials, and motivated students to participate more actively throughout each stage of the learning process. These perceptions were consistent with classroom observations, which showed that students not only paid attention to the teacher's explanations but also actively participated in discussions, answered questions, operated the smartboard while completing quizzes, and engaged in educational games prepared by the teacher. The classroom documentation and lesson modules further revealed that these activities had been intentionally designed as part of the instructional strategy, ensuring that smartboard utilization was systematically planned and aligned with the predetermined learning outcomes and objectives. The interview, observation, and documentation findings consistently reinforce one another regarding the impact of smartboard utilization. Teachers' perceptions of increased classroom interaction and student engagement were consistent with the observed learning activities and with the instructional plans documented in the lesson modules prepared by the sixth-grade teachers.

Challenges Encountered in Smartboard Utilization

Limited facilities remained the most frequently reported challenge in smartboard utilization. The sixth-grade teachers explained that the school possessed only one smartboard unit, requiring its use to be scheduled alternately among different classes. As a result, teachers had to adjust their instructional schedules whenever they intended to use the device. Another challenge identified by the teachers was the instability of the internet connection. This condition prevented online learning videos and internet-based educational applications from being used optimally during every lesson.

Classroom observations showed that smartboard utilization followed the schedule established by the school. Teachers prepared their instructional materials according to the allocated time for using the device, although in certain situations coordination with other teachers was still required when the smartboard needed to be used outside the scheduled timetable. Documentation of the smartboard usage schedule further demonstrated that access to the device was organized on a rotational basis to ensure that all classes had equal opportunities to use it. The consistency of the interview, observation, and documentation findings indicates that the limited availability of smartboard devices and the quality of the internet connection remain the primary challenges in smartboard utilization.

The challenges encountered by teachers were not limited to technical aspects but also emerged during classroom instruction. The teachers' experiences indicated that adapting to the various features of the smartboard required time before the device could be utilized optimally. The teachers also explained that the relatively large number of students in each class made it difficult to provide every student with the opportunity to use the smartboard directly within a single lesson.

The observed classroom instruction showed that teachers managed smartboard use by allowing students to take turns during digital quizzes and educational games. Students who had not yet been given the opportunity to operate the smartboard remained actively involved through group discussions or by responding from their seats. This instructional approach was also reflected in the classroom documentation, which showed that students had been organized into groups before the lesson began. These findings indicate that the pedagogical challenges were primarily related to managing learning activities in ways that enabled all students to remain actively engaged throughout the use of the smartboard.

Teachers' Strategies for Optimizing Smartboard Utilization

Efforts to optimize smartboard utilization were supported by school policies that provided teachers with opportunities to improve their competencies in using educational technology. The vice principal for curriculum affairs explained that teachers regularly participated in training programs organized by the Department of Education. The knowledge acquired during

these training sessions was subsequently shared with other teachers through mentoring activities conducted at the school. In addition, the school established a smartboard usage schedule to ensure that every teacher had an equal opportunity to utilize the device during classroom instruction.

The lesson plans prepared by the teachers indicated that smartboard utilization had been planned from the outset through the lesson modules. Teachers incorporated the smartboard as one of the instructional media aligned with the learning objectives, instructional content, and learning activities. These documents demonstrate that smartboard utilization was not merely dependent on the availability of the device but had become an integral part of instructional planning.

The teachers also developed various strategies to ensure that smartboard utilization remained effective despite several existing limitations. Learning videos, animations, digital quizzes, and various educational applications were selected according to the characteristics of the instructional content. The development of these learning media was supported by teachers' habits of independently seeking instructional resources while collaborating with colleagues in designing lesson modules, selecting appropriate learning media, and identifying smartboard features that best suited instructional needs.

Classroom observations showed that these strategies were implemented consistently throughout the learning process. Teachers combined presentations, videos, educational games, and digital quizzes into a single sequence of learning activities, enabling the smartboard to function not only as a medium for delivering instructional content but also as a tool that promoted student engagement. Similar evidence was found in the lesson modules, which documented each learning activity before classroom implementation. The consistency of the interview, observation, and documentation findings indicates that the optimization of smartboard utilization was achieved through careful instructional planning, collaboration among teachers, the use of various digital learning resources, and school support in facilitating the integration of educational technology.

Sixth-Grade Teachers' Perceptions of Smartboard Utilization in Classroom Instruction

The findings revealed that the sixth-grade teachers at SD Negeri Serang 02 held positive perceptions of smartboard utilization in classroom instruction. These perceptions were reflected in the teachers' understanding of the smartboard as a digital learning medium, their experiences using it throughout various stages of instruction, and their evaluation that the technology facilitated instructional delivery while increasing student engagement. These findings are consistent with the Technology Acceptance Model (TAM) proposed by Davis (1989). The model explains that technology acceptance is influenced by users' perceptions of its usefulness (perceived usefulness) and its ease of use (perceived ease of use). In educational settings, these two perceptions play an important role in shaping teachers' willingness to adopt and integrate technology into classroom instruction. Dina et al. (2023) also emphasized that TAM remains relevant for explaining technology acceptance among elementary school teachers. Teachers tend to develop positive attitudes toward educational technology when they perceive it as beneficial for supporting instruction and easy to use in their teaching practices.

Teachers' experiences using the smartboard indicate that positive perceptions were not formed solely because the technology was available at the school but rather developed through repeated use across different stages of classroom instruction. The findings showed that the smartboard was utilized from introductory activities, instructional delivery, and group discussions to educational games and learning assessments. These experiences provided teachers with opportunities to become familiar with the characteristics of each smartboard feature and to adapt them according to the intended learning objectives. Using the smartboard throughout various instructional

stages enabled teachers to understand the functions of each feature based on instructional needs. This finding demonstrates that practical experience strengthens teachers' perceptions of the usefulness of technology, as explained in the Technology Acceptance Model (Davis, 1989). The findings also support those of Dina et al. (2023), who reported that experience in using technology is one of the factors that encourages teachers to continue integrating technology into classroom instruction.

Teachers' positive evaluations of smartboards emerged because they experienced noticeable improvements in the instructional process after adopting the technology. They perceived that presenting instructional materials through images, videos, animations, digital quizzes, and educational games made classroom instruction more varied and encouraged students to participate actively in every learning activity. These positive evaluations were based not merely on the technological sophistication of the smartboard but on the practical benefits experienced during classroom instruction. The findings indicate that teachers are more likely to continue utilizing technology when it provides tangible benefits for teaching and learning activities. These findings are supported by Belinda et al. (2023), who reported that the use of interactive whiteboards enhances student engagement during classroom instruction. Similar findings were reported by Jandri et al. (2025), who concluded that smartboard utilization supports more interactive learning activities, thereby increasing students' participation throughout the learning process.

Teachers' positive perceptions were also reflected in the way they integrated smartboards into instructional planning. The findings showed that smartboard utilization had been planned from the lesson preparation stage through the alignment of learning objectives, instructional media, learning activities, and assessment. These findings demonstrate that teachers did not use smartboards spontaneously; instead, they incorporated them as an integral part of instructional strategies tailored to the characteristics of the learning content and students' needs. This condition indicates that technology acceptance extends beyond the stage of technology use and develops into the ability to integrate technology systematically into instructional practice. From the perspective of TAM, teachers who have integrated smartboards into instructional planning demonstrate that the technology is no longer perceived merely as a supplementary tool but has become an accepted component of the instructional process. These findings are consistent with Alindra et al. (2025), who explained that the successful implementation of educational technology is influenced by teachers' readiness to manage and utilize technology according to instructional needs.

The findings further indicate that teachers' perceptions of smartboard utilization were not formed solely by the availability of the technology in the school. Rather, these perceptions developed through teachers' experiences of using smartboards during classroom instruction and recognizing their benefits in facilitating instructional delivery and enhancing student engagement. These experiences encouraged teachers to incorporate smartboards into both instructional planning and classroom implementation instead of using them merely as supplementary instructional media under certain circumstances. This study not only demonstrates that teachers hold positive perceptions of smartboards but also explains how these perceptions are formed—through teachers' understanding of the functions of smartboards, their experiences using them during classroom instruction, and the benefits they perceive throughout the teaching and learning process. These findings complement the studies by Hartati et al., (2025) and Kournikova et al., (2025), which showed that teachers' acceptance of technology is influenced by the benefits they experience during classroom instruction. In the present study, these benefits are reflected not only in the ease of using smartboards but also in teachers' ability to integrate the technology into instructional strategies that align with learning objectives and students' educational needs.

Challenges Encountered by Teachers in Smartboard Utilization

The implementation of smartboards in sixth-grade classroom instruction indicates that teachers' acceptance of technology has not entirely eliminated the challenges encountered during the learning process. This study found that the limited number of smartboard devices and unstable internet connectivity remained the primary obstacles to smartboard utilization. The need to share the device among classes and adjust learning activities when the internet connection was unstable demonstrates that successful technology integration requires adequate infrastructure support. These findings indicate that teachers' readiness and the availability of technological facilities are complementary factors in supporting effective smartboard utilization. This finding reinforces the study by Alindra et al. (2025), which reported that the successful implementation of educational technology is influenced by the readiness of school facilities. This explanation is further supported by Sa'odah et al. (2022), who argued that the quality of digital infrastructure is one of the key factors determining the effectiveness of technology-based learning media.

The challenges encountered by teachers were not limited to infrastructure but also involved classroom management. The relatively large number of students prevented all learners from having the opportunity to use the smartboard directly within a single lesson. Consequently, teachers were required to organize students into groups, schedule turns for using the smartboard, and design learning activities that continued to engage all students. These findings indicate that the successful utilization of smartboards depends not only on teachers' ability to operate the technology but also on their pedagogical competence in managing classroom instruction to ensure that every student has meaningful learning opportunities. This explanation is consistent with Syifa & Julia (2023), who stated that the success of technology-based instructional innovation is influenced by teachers' ability to manage the learning process according to students' characteristics.

Teachers' Strategies for Optimizing Smartboard Utilization

The strategies employed by teachers to optimize smartboard utilization were closely supported by the school's policies and initiatives. This study found that the school not only provided smartboard facilities but also established a usage schedule, offered teachers opportunities to participate in professional training, and encouraged knowledge-sharing activities following the completion of training programs. These forms of support demonstrate that successful smartboard implementation depends not only on individual teachers' competencies but also on school policies that promote the integration of technology into classroom instruction. This finding is also related to the first research objective, which revealed that teachers had already integrated smartboards into their lesson modules before classroom implementation. This condition indicates that school support extends beyond providing technological facilities by creating an environment that encourages teachers to plan smartboard utilization more systematically. These findings support Hidayah & Fauziah (2025), who argued that school policies and teacher competency development are essential factors in achieving successful technology integration in education.

Teachers also developed various strategies to overcome the limitations encountered during smartboard utilization. The findings indicate that teachers did not rely solely on training programs provided by the school but also enhanced their competencies through various digital learning resources and collaborative discussions with colleagues. The knowledge and instructional resources obtained through these activities were subsequently adapted to the characteristics of the instructional content and students' learning needs before being implemented in the classroom. These efforts demonstrate that teachers' experiences using smartboards encouraged them to continuously improve their instructional practices according to classroom conditions. Such competencies developed through

continuous learning, reflection, and professional collaboration. These findings reinforce the argument of Whindayati et al. (2025), who stated that teachers' digital competence develops continuously through teaching experience. This explanation is further supported by Pangkey & Gampu (2025), who emphasized that collaboration among teachers is an important factor in supporting technology-based instructional innovation.

The optimization of smartboard utilization identified in this study demonstrates that teachers' strategies and school support complement one another in facilitating the effective integration of technology into classroom instruction. Although the limited availability of smartboard devices and unstable internet connectivity remained significant challenges, these conditions did not discourage teachers from continuing to utilize the technology. School support through professional training, scheduled access to smartboard facilities, and opportunities for teachers to share their experiences created an environment in which teachers were able to develop instructional strategies that addressed classroom needs. Unlike previous studies (Hartati et al., 2025; Kournikova et al., 2025), which primarily focused on teachers' acceptance of educational technology, the present study demonstrates that the sustained utilization of smartboards is fostered through the interaction between teachers' positive perceptions, institutional support from the school, and the adaptive strategies developed by teachers to overcome challenges encountered during the instructional process.

CONCLUSION

This study demonstrates that the sixth-grade teachers at SD Negeri Serang 02 hold positive perceptions of the use of smartboards as interactive digital learning media. These perceptions were developed through the teachers' understanding of the functions of smartboards, their experiences using them throughout various stages of classroom instruction, and their evaluation of the benefits gained during the teaching and learning process. The teachers perceived that smartboards helped them deliver instructional materials in a clearer, more engaging, and more interactive manner, thereby increasing students' participation in classroom learning activities. The findings also revealed that smartboard utilization had been planned from the lesson planning stage through the preparation of lesson modules and was implemented during introductory activities, instructional delivery, group discussions, educational games, digital quizzes, and learning assessment. These findings indicate that smartboards were not merely used as presentation tools but had become an integral part of the instructional strategies implemented by teachers in the classroom.

The implementation of classroom instruction using smartboards still encountered several challenges. The limited number of smartboard devices, unstable internet connectivity, and the management of classroom activities when many students wished to use the smartboard directly were identified as the primary challenges faced by teachers. Nevertheless, these limitations did not prevent teachers from utilizing smartboards in classroom instruction, as they continuously adapted their teaching practices to the existing conditions.

The optimization of smartboard utilization was supported by both school policies and teachers' initiatives. To enhance teachers' competencies, the school facilitated participation in professional training programs, organized a schedule for smartboard use, and encouraged teachers to share their experiences with colleagues. Teachers also developed various strategies through systematic instructional planning, the use of diverse digital learning resources, self-directed learning, and collaboration with fellow teachers. The findings indicate that the successful utilization of smartboards is not determined solely by the availability of technological facilities within the school. Teachers' perceptions, institutional support, and teachers' ability to adapt instructional strategies to students' learning needs all play important roles in optimizing smartboard utilization.

The scope of this study remains limited because it was conducted in only one elementary school and involved four sixth-grade teachers and one vice principal as participants. Therefore, the findings represent the context of that particular school and cannot be generalized to elementary schools with different characteristics. To obtain a broader understanding, future studies should involve a larger number of schools and participants from diverse educational settings. Future research may also investigate the relationship between smartboard utilization and students' learning outcomes, learning motivation, and classroom engagement to provide a more comprehensive understanding of the contribution of smartboards to the teaching and learning process.

REFERENCES

Agustina, K. S. (2024). The Role of Technology and Learning Media for Primary School Students in Citizenship Learning. *International Journal of Students Education*, *2*(2), 1–5. https://doi.org/https://doi.org/10.62966/ijose.vi.728

Aini, P. R., Yuliyani, & Pratama, R. (2024). Penggunaan Media Smartboard dalam Meningkatkan Pemahaman Siswa pada Pelajaran PAI di SD Prestige Bilingual School. *Permata: Jurnal Pendidikan Agama Islam*, *5*(2), 330–340. https://doi.org/https://doi.org/10.47453/permata.v5i2.3055

Alindra, A. L., Afrilia, Hendranti, A. H., Setiasari, D., Handayani, I., Syifa Miana, Pratiwi, P. A., & Layla, T. (2025). Implementasi Pemanfaatan Teknologi Untuk Pembelajaran Inovatif Di Lingkungan Sekolah Dasar. *DE_JOURNAL (Dharmas Education Journal)*, (1).

Azzahra, P. M., Rizki, A. N., Bella, R. G. R. S., Silvia, M. D., & Amalia, D. (2025). Pengaruh Penggunaan Smart Board terhadap Hasil Belajar Siswa Sekolah Dasar. *Prosiding Seminar Nasional Pendidikan, Bahasa, Sastra, Seni, Dan Budaya (Mateandrau)*, *4*(2). https://doi.org/10.55606/mateandrau.v4i2.3179

Belinda, L. N., Iskandar, S., & Kurniawan, D. T. (2023). Penggunaan Media Pembelajaran Papan Tulis Interaktif di Kelas Pada Abad 21. *Jurnal Lensa Pendas*, *8*(1), 23–31. https://doi.org/10.33222/jlp.v8i1.2555

Chusna, I. F., Aini, I. N., Putri, K. A., & Elisa, M. C. (2024). Literatur Review: Urgensi Keterampilan Abad 21 Pada Peserta Didik. *Jurnal Pembelajaran, Bimbingan, Dan Pengelolaan Pendidikan*, *4*(4), 1. https://doi.org/10.17977/um065.v4.i4.2024.1

Creswell, J. W., & Poth, C. N. (2025). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (5th ed.). SAGE Publications, Inc.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology*: Management Information Systems Research Center, University of Minnesota*, *13*(3).: http://www.jstor.org/stable/249008.

Dina, L. N. A. B., Faizah, S. N., & Anggraini, A. E. (2023). Analysis Technology Acceptance Model (TAM) Pre-Service Elementary School Teachers. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, *5*(1), 271–289. https://doi.org/10.37680/scaffolding.v5i1.2089

Firmansyah, F., Tafakur, T., Destiana, B., & Dewi, A. S. (2024). Defining Technology-Based Learning Media in Science Subjects for Elementary Schools. *Jurnal Prima Edukasia*, *12*(2), 242–252. https://doi.org/10.21831/jpe.v12i2.71824

Hartati, N., Aulida, R., & Sartono. (2025). Persepsi Guru terhadap Penggunaan Media Pembelajaran Berbasis Digital di SDIT Ridhotullah. *Perspektif: Jurnal Pendidikan Dan Ilmu Bahasa*, *3*(2), 144–152. https://doi.org/10.59059/perspektif.v3i2.2432

Hidayah, R., & Fauziah, M. (2025). Elementary School Teachers' Perspectives on Integrating Technology, Information, and Communication in Education. *AL-ISHLAH: Jurnal Pendidikan*, *17*(1). https://doi.org/10.35445/alishlah.v17i1.6268

Jandri, A. E., Saputra, D. A., Nopemberi, M., Ramadhani, N., Ardila, N., Yuni, Z. P., & Marlia, A. (2025). Meningkatkan Motivasi Belajar Siswa Melalui Penggunaan Smartboard Dalam Pembelajaran Pendidikan Pancasila Di Kelas V Sdn 07 Mudiak Lawe Kecamatan Sungai Pagu Kabupaten Solok Selatan. *Indonesian Journal of Elementary Education (IJETE)*, *1*(2), 176–183. https://doi.org/10.62567/ijete.v1i2.1682

Kournikova, F. A. C., Putri, R. A., Ajmii, F. N., & Saputri, R. E. (2025). Persepsi Guru Sekolah Dasar Terhadap Penggunaan Teknologi Informasi Dan Komunikasi Dalam Meningkatkan Efektivitas Pembelajaran. *Didaktik: Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *11*(3), 259–273. https://doi.org/https://doi.org/10.36989/didaktik.v11i03.7767

Pangkey, R. D. H., & Gampu, G. (2025). Elementary School Teacher's Perceptions of the Use of Digital Learning Applications in Enhancing Student Engagement. *International Conference on Educational Science and Teacher Education (ICESTE 2025)*, 484–492. https://doi.org/10.2991/978-2-38476-489-1_36

Rahayu, M. A., & Makmur, A. (2024). The Effectiveness of Using SmartBoard Interactive Toward Learning Innovation in Schools. *JIV-Jurnal Ilmiah Visi*, *19*(1), 23–31. https://doi.org/10.21009/jiv.1901.3

Sa'odah, S., Yuniasih, N., & Haryanti, Y. D. (2022). Learning Technology in Elementary School. *AL-ISHLAH: Jurnal Pendidikan*, *14*(4), 6739–6744. https://doi.org/10.35445/alishlah.v14i4.1488

Saputra, D. S., Mulyati, T., & Susilo, V. (2022). Perception Of Elementary School Teachers and Students on Digital Augmented Reality Learning Media. *EduHumaniora: Jurnal Pendidikan Dasar*, *14*(1), 95–102.

Sembiring, D., & Kona, M. (2024). *Inovasi Teknologi Pembelajaran* (A. Asari, Ed.). PT MAFY MEDIA LITERASI Indonesia.

Sugiyono. (2024). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (2nd ed.). Alfabeta.

Suhirman, L., Marta, R. F., Wachyudi, K., Wibawa, A. P., Ismail, Adawiyah, R., Anyan, & Puteri, G. B. (2025). *Media Pembelajaran* (L. Dwi, Ed.). CV. Askara Sastra Media.

Syifa, N., & Julia, J. (2023). Persepsi Guru Sekolah Dasar Terhadap Inovasi Pembelajaran Berbasis Informasi Teknologi Sebagai Alat Bantu Pencapaian Pembelajaran. *Al-Madrasah: Jurnal Pendidikan Madrasah Ibtidaiyah*, *7*(1), 271. https://doi.org/10.35931/am.v7i1.1707

Wang, C., Zhang, M., Sesunan, A., & Yolanda, L. (2023). *Peran Teknologi Dalam Transformasi Pendidikan Di Indonesia: Tinjauan DampakTerkini Gerakan Merdeka Belajar*. http://repositori.kemendikdasmen.go.id/id/eprint/30537

Whindayati, A., Fauziah, R. N., Fatimah, S., Yusmaini, & Handayani, D. (2025). Penguatan Kompetensi Abad 21 dalam Pembelajaran di Era Digital: Tantangan dan Strategi Pendidik Indonesia. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *10*(4).

Winayu, I. M. (2024). The Use of Digital Smart Boards as a Means of Supporting TPACK-Based Interactive Learning. *PPSDP International Journal of Education*, *3*(2), 367–381. https://doi.org/https://doi.org/10.59175/pijed.v3i2.316