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Smart School Management Through Digital Transformation: A Case Study of Nasima Elementary School, Semarang City

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ABSTRACT

Objective: This study evaluates the implementation of smart school management through digital transformation at Nasima Elementary School (SD Nasima), Semarang City, focusing on the managerial processes of planning, organizing, implementing, and supervising the school's digitalization. **Methods**: This qualitative case study employed various data collection techniques, namely observation, in-depth interviews, and documentation, to comprehensively investigate the management strategies applied throughout the digital transformation process. **Results**: SD Nasima has successfully integrated digital technologies into its curriculum, infrastructure, and school management. The implementation of a Learning Management System, smartboards, and other digital tools has enhanced the effectiveness of the teaching and learning process. However, challenges remain in areas such as teachers' digital skills, team coordination, and the allocation of resources for continuous training and support. Well-structured planning, clear organization, effective implementation, and consistent supervision influence the success of digital integration. **Novelty**: This study presents a comprehensive digital transformation management model at the elementary school level based on a local case study approach, which remains underexplored in the context of Indonesian basic education. This provides practical insights for schools seeking to adopt similar approaches to educational digitalization.

INTRODUCTION

With the rapid advancement of information and communication technology (ICT), Indonesia's education sector is facing numerous challenges. In response, the "smart school" concept has emerged as a strategic solution that leverages digital technology to improve both learning quality and school management. Such transformation is regulated in the Government Regulation Number 19 of 2005 on National Education Standards and the Regulation of the Minister of Education and Culture Number 32 of 2013, which emphasize ICT integration as a means to enhance educational quality (Supriyadi, 2021).

According to Prabowo et al. (2022), a smart school is an educational institution that systematically integrates digital technology into its learning, administration, and communication processes. The adoption of digital technology has been shown to improve student outcomes by up to 30% (Ullah et al., 2021). In addition to fostering academic achievement, digital transformation reshapes instructional methods, learning processes, and stakeholder engagement. This is consistent with the finding of Gull et al. (2024) that digital transformation can promote operational efficiency and the overall learning experience, thereby equipping students for future challenges. To foster educational innovation, school principals must take the lead in digital transformation (Harris, 2023). Similarly, Gusman (2019) emphasizes that successful digital transformation relies heavily on the principal's capacity to plan, organize, implement, and supervise technological changes.

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Nasima Elementary School (hereinafter referred to as SD Nasima) is a leading private elementary school in Semarang that represents a successful smart school model. To streamline academic management, the school has adopted an Academic Information System (*Sistem Informasi Akademik*/SIA). This results in national recognition, including awards from Microsoft Indonesia for its excellence in blended learning and the Inspiring Principal awards for its principal at the 2021 and 2022 Acer Smart School Awards (ASSA). Nevertheless, leadership transitions pose challenges in sustaining a consistent technology-based school culture. Therefore, this study investigates how the principal of SD Nasima manages digital transformation through planning, organizing, implementing, and supervising efforts to achieve sustainable smart school goals. Several previous studies have discussed the integration of technology into education management. Table 1 summarizes the similarities, differences, and findings of relevant prior studies in relation to the present study.

Table 1. Relevant Studies

Researcher	Year	Title	Similarities	Diferences	Findings
Rohman	(2022)	Management of Project-Based Learning (PBL) Model in Enhancing 21st-Century Skills	Focusing on instructional management and improving education quality.	Specifically discussing PBL as a learning model.	PBL sharpens students' 21st-century skills at SD Smart School.
Gunarto	(2023)	Smart Classroom-Based Learning Management to Improve Student Learning Outcomes at SMAIT Al-Multazam	Emphasizing learning management to enhance education quality.	Utilizing Smart Classroom as a technological learning approach.	The Smart Classroom approach significantly improves students' learning outcomes at SMAIT Al-Multazam 2.
Habibi	(2024)	Madrasa Head's Supervisory Management in Improving Teacher Performance at MTs NU Putra I Buntet Pesantren	Discussing educational management and the improvement of teacher performance.	Focusing on the madrasa head's supervision in enhancing teacher performance.	Supervision by the madrasa head plays a crucial role in improving teacher professionalism.
Negara, et al.	(2024)	Principal's Management in Enhancing Teacher Performance at SD Negeri Tanjungsari 01, Wanasari Subdistrict	Discussing the principal's role in improving teacher performance.	Focusing on primary schools rather than madrasas or secondary schools.	The principal has a central role in enhancing teacher performance.

While these studies have addressed technology and educational leadership, most of them focused on isolated aspects, such as instructional models or teacher supervision, rather than comprehensive school management. Moreover, the majority of these studies explore secondary or higher education contexts, leaving elementary schools relatively underexamined. Furthermore, only a few studies have evaluated the challenges facing principals in sustaining digital transformation, including those concerning infrastructure readiness, teachers' digital literacy, and communication with stakeholders.

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Effective educational management requires not only efficient resource allocation but also the facilitation of innovation through technology (Mintzberg, 2020), and its successful implementation depends on careful and comprehensive planning, efficient organization, as well as proper and constant supervision (Greenberg & Baron, 2020; Widianti, 2021). According to Sihombing (2021), technology-based management enhances both academic and administrative quality. Similarly, Sugiri et al. (2023) argue that structured planning in technology integration significantly improves school performance and learning outcomes.

Smart schools integrate technology into all aspects of school operations (Gusman, 2019), promoting efficiency, quality, and character education (Khodarahmi et al., 2024; Sihombing, 2021). Learning management systems (LMS) and e-learning platforms enable adaptive learning tailored to student needs (Prabowo et al., 2022; Adiyono et al., 2024). Yukl (2019) defines digital transformation as the enhancement of organizational capacity through ICT, a perspective echoed by the Ministry of Education and Culture of the Republic of Indonesia, which advocates replacing traditional systems with modern technologies. Digital transformation has been shown to foster student engagement and improve learning efficiency, even at the elementary school level (Ariesta, 2019; Supriyadi, 2021; Sugiri et al., 2023).

School principals play a decisive role in leading digital transformation. Visionary leadership and team motivation are essential for successful technology integration (Yaminah et al., 2023). Prior studies have demonstrated that the principal's active involvement accelerates the implementation of smart schools (Gusman, 2019; Navaridas-Nalda et al., 2020). Other critical elements of smart schools include adequate infrastructure, digital curriculum, and interactive learning methods (Wiyono et al., 2024), with high-speed internet and appropriate digital devices being the prerequisites for success (Derder et al., 2023).

In conclusion, the existing literature highlights the growing importance of technology-driven educational management and the central role of school principals in ensuring effective digital transformation. A smart school is defined not only by the presence of digital tools but also by its capacity to manage changes in a structured, efficient, and future-oriented manner.

This study aims to contribute to two major aspects of digital transformation in smart school management. First, this study proposes a smart school management model that integrates four managerial functions—i.e., planning, organization, implementation, and supervision—into a technology-based framework. Unlike previous studies that examine one or two dimensions separately, this study adopts a holistic approach to foster an adaptive and responsive educational environment. Second, this study bridges the contextual gap by focusing on smart school implementation within Indonesian elementary education, specifically at SD Nasima in Semarang City. Considering the paucity of research on smart school practices at the elementary level, this study is crucial to conduct.

RESEARCH METHOD

This study adopts a qualitative research approach with a descriptive case study design to obtain an in-depth understanding of smart school management through digital transformation at SD Nasima, Semarang City. The objective is to explore real-world phenomena holistically and contextually, particularly on how digital transformation is

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integrated into school management practices. According to Sugiyono (2023), qualitative research aims to provide a comprehensive description of phenomena and gain a profound understanding of individual or group experiences within their natural setting.

This study focuses on the implementation of technology-based school management in a leading private elementary school. SD Nasima was purposively selected as the research location due to its recognized success in applying digital systems in both administration and learning processes, as well as its continued efforts to sustain transformation amid leadership transitions. The study was conducted from January to May 2025 to capture the dynamics, progress, and challenges of digital transformation within this particular institutional context.

To allow detailed contextual exploration of the complex issues (Creswell, 2018), this qualitative case study is structured into five stages: (1) problem identification; (2) data collection; (3) data analysis; (4) triangulation; and (5) reporting. The first stage is the identification of barriers and enabling factors in digital transformation, which include infrastructure limitations, organizational adaptation, and cultural shifts within the school. The second stage involves collecting data from multiple sources to build a comprehensive picture of the phenomenon. The third and fourth stages are systematic data analysis and validity testing, whose findings are presented descriptively at the final stage to inform relevant policies and practices. To provide a clearer overview, the research design is displayed in Table 2, outlining each stage and its corresponding description.

Tabel 2. Research Design

Research Stage	Description
Problem Identification	Determining issues related to the implementation of smart school at SD Nasima, particularly digital transformation challenges.
Data Collection	Conducting observations, in-depth interviews, and document studies to gather relevant data.
Data Analysis	Performing data reduction and presentation, and drawing conclusions based on collected data.
Triangulation	Applying triangulation techniques by comparing data from interviews, observations, and documents.
Reporting	Preparing a research report that includes findings, discussions, and recommendations for further development.

To gather relevant and reliable data, this study employed three data collection techniques: observation, in-depth interviews, and document studies. Direct observation was used to examine daily technology practices in classrooms, administrative systems, and stakeholder interactions. The observation framework was structured into four dimensions: (1) Learning activities: how teachers and students use digital tools, e.g., Learning Management Systems (LMS) and interactive media; (2) Administrative processes: the utilization of the Academic Information System (SIA) for academic and non-academic management; (3) Digital infrastructure: the availability and use of facilities, such as internet connectivity, digital devices, and supporting hardware; and (4) Stakeholder interactions: the communication and collaboration patterns among principals, teachers, staff, students, and parents through digital platforms. This

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systematic observation enabled the apprehension of both the practical application and contextual dynamics of the school's digital transformation (Arikunto, 2020).

In-depth interviews were conducted face-to-face in the school environment with key stakeholders, namely the school principal, six teachers across grade levels, three administrative staff, and five parents. The interviews followed a semi-structured format, allowing flexibility while ensuring consistency across participants. Each session lasted for 45–60 minutes. With participants' consent, the interviews were audio-recorded and subsequently transcribed for analysis. The interview guide covered the following themes: (1) Leadership strategies in planning and managing digital transformation; (2) Teachers' and staff's experiences in adopting digital tools; (2) Challenges faced in sustaining technology integration (e.g., infrastructure, digital literacy, coordination); (3) Perceived impacts on learning quality, administrative efficiency, and school culture; and (4) Stakeholders' expectations and recommendations for future improvement. This protocol ensured that the collected data were rich in content and directly aligned with the research objectives (Moleong, 2021).

To complement the primary data, document studies were carried out by reviewing the school's reports, digital transformation plans, policies related to the Academic Information System, digital curricula, and other institutional artifacts that reflect the school's digital journey (Arikunto, 2020). A summary of the data collection techniques employed in this study is presented in Table 3.

Tabel 3. Data Collection Techniques

Data Collection Technique	Description
Observation	Directly observing technology-based learning activities and digital school management.
Interviews	Exploring the perceptions and experiences that the principal, teachers, administrative staff, and parents have of smart school implementation.
Document Studies	Collecting secondary data from annual reports, school policies, digital curricula, and other documents.

The collected data were analyzed qualitatively, comprising data reduction to focus on meaningful content by excluding irrelevant or redundant information, data display to present the findings in narrative and tabular form, and conclusion drawing that involved identification of themes, patterns, and relationships (Sugiyono, 2023).

Several strategies were adopted to ensure data validity: (1) triangulation of sources and techniques to cross-verify data from interviews, observations, and documents (Creswell, 2018); (2) member-checking by sharing preliminary interpretations with key informants to confirm their accuracy (Moleong, 2021); (3) prolonged engagement in the field to build trust and deepen contextual understanding (Riduwan, 2021); and(4) an audit trail maintenance to ensure transparency and traceability throughout the research process, thereby enhancing credibility and accountability.

RESULTS AND DISCUSSION

Results

This study evaluates the management of smart schools through digital transformation at SD Nasima, Semarang City, by focusing on four functions: planning, organization,

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implementation, and supervision of the smart school program. The results of data analysis reveal that the smart school management at SD Nasima has been well implemented, despite several challenges faced during the digital transformation process. This subsection presents the findings related to each function in detail.

The integration of digital technology into the school's vision and mission marked the beginning of the planning process for the smart school concept implementation at SD Nasima. Together with the IT team, the principal devised the technology implementation plan by incorporating various tools (hardware and software) needed to support digital-based learning. In the interview, the principal stated that one of the initial steps in planning was setting technology use objectives, which included infrastructure, digital curriculum, and teacher training development. One of the planning outcomes was the formulation of a digital transformation roadmap involving technology procurement, teacher training, and the development of learning programs based on a Learning Management System (LMS). Table 4 explains all aspects of the planning process of establishing the smart school program at SD Nasima.

Tabel 4. Planning of the smart school program at SD Nasima, Semarang City.

Planning Aspect	Research Findings	Data Sources
Goal Formulation	The principal established goals in collaboration with teachers, the IT team, and parents, focusing on digital literacy and administrative digitalization.	Interviews W-P1, W-P2, W-P3, Document Studies
Program Development	The school developed LMS-based programs (short-term and long-term) and conducted continuous teacher training.	Interviews W-P4, W-P5, W-P6, Document Studies
Resource Provision	Various hardware (laptops, projectors, and internet) and software (LMS, learning applications) were provided to support digital learning.	Interviews W-P7, W-P8, W-P9, Document Studies

The organization of the smart school program at SD Nasima involved forming an IT team responsible for system maintenance and technology infrastructure management. A curriculum team was also established with the responsibility of designing an interactive digital curriculum. Data from direct observations showed effective coordination among the IT team, the teachers, and the principal of SD Nasima. The organizational structure facilitated collaboration among stakeholders to ensure smooth technology adoption in the learning process. The three aspects of the smart school program organization at SD Nasima are described in Table 5.

Table 5. Organization of the smart school program at SD Nasima, Semarang City

Organization Aspect	Research Findings	Data Sources
Team Formation	The IT team was formed (through internal selection based on competence and interest) to integrate technology into learning.	Interviews W-O1, W-O2, W-O3
Task Distribution	Tasks were assigned according to expertise; the IT team managed the	Interviews W-O4, W-O5, W-O6

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Organization Aspect	Research Findings	Data Sources
	infrastructure, while the teachers developed digital teaching content.	
Coordination	Coordination was facilitated by digital platforms and regular forums between teachers and the IT team.	Interviews W-O7, W-O8, W-O9

The implementation of digital transformation at SD Nasima manifested in the use of various digital systems and platforms, such as Microsoft Teams for online learning and smartboards for mathematics lessons. Teachers were trained to utilize technology when teaching, and students were provided with equal access to active participation in e-learning activities. Implementation results reveal increased interaction among students, teachers, and parents through digital platforms. Furthermore, learning evaluations were carried out automatically using computer-based systems, thus facilitating data collection and analysis of student learning outcomes. The implementation aspects of the smart school program establishment at SD Nasima are shown in Table 6.

Table 6. Implementation of the smart school program at SD Nasima, Semarang City

Implementation Aspect	Research Findings	Data Sources
Team Formation	The IT team was formed (through internal selection based on competence and interest) to integrate technology into learning.	Interviews W-O1, W-O2, W-O3
Task Distribution	Tasks were assigned according to expertise; the IT team managed the infrastructure, while the teachers developed digital teaching content.	Interviews W-O4, W-O5, W-O6
Coordination	Coordination was facilitated by digital platforms and regular forums between teachers and the IT team.	Interviews W-O7, W-O8, W-O9

The supervision of the smart school program implementation at SD Nasima was conducted periodically through evaluations of technology performance and digital curriculum. The principal, together with the IT team and teachers, conducted continuous monitoring to ensure the system operated according to plan. Additionally, feedback from parents on the use of digital platforms to monitor their children's progress was collected to ensure program effectiveness. Evaluations assessed the success of technology use in learning and school management.

Table 7. Supervision of the smart school program through digital transformation at SD Nasima, Semarang City.

Supervision Aspect	Research Findings	Data Sources
Learning Evaluation	Supervision through the evaluation of student feedback and online quiz results ensures effective technology-based learning.	Interviews W-P1, W-P2, W-P3, Observation
Technology Usage Evaluation	This includes supervision of technology use, such as LMS	Interviews W-P4, W-P5, W-P6, Observation

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	and smartboards, as well as monitoring of hardware and software used by teachers and students.	
Teacher Performance Supervision	Teacher engagement in technology use for teaching was monitored, particularly by the principal, through direct classroom visits and teacher performance analysis.	Interviews W-P7, W-P8, W-P9, Observation
Feedback Implementation	Student and parent feedback was obtained each semester to evaluate digitalization and technology-based learning, as well as to encourage continuous improvement.	Interviews W-P10, W-P11, W-P12, Observation
Infrastructure Monitoring	Supervision of digital infrastructure readiness, such as internet speed and device availability, was exercised to identify and address technical issues.	Interviews W-P13, W-P14, Document Studies
LMS System Evaluation	Monitoring of LMS usage based on login data, participation, and feedback ensures teachers' and students' accessibility and convenience.	Interviews W-P15, W-P16, Document Studies

SD Nasima's principal plays a vital role in the success of digital transformation. In the interview, the principal stated that without strong support and leadership, the digitalization process would be difficult to realize. In this regard, the principal is not only responsible for administrative aspects but also acts as an agent of change who encourages teachers and staff to adapt to new technologies. Furthermore, the principal ensures that all policies and planning reflect the school's vision to become a leading technology-based school.

Discussion

The findings of this study indicate that the digital transformation planning process at SD Nasima was carried out comprehensively and participatively, involving the principal, IT team, teachers, and parents. This is demonstrated by the formulation of clear objectives aimed at improving learning quality and management efficiency, as well as by the human resource development strategies and the utilization of technology, including the Learning Management System (LMS). These findings confirm the statement of Ginting (2024) that thorough planning is the key to successfully integrating technology into education. Additionally, this study provides a new perspective by exposing how the smart school planning at SD Nasima is not only internally oriented but also responsive

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to external policies such as *Merdeka Belajar* (Nursanti & Ramadhan, 2023) and the local needs of students.

Unlike a previous study that primarily highlights the importance of infrastructure and training (Kustandi & Ibrahim, 2021), this study reveals that stakeholder collaboration (with parents and the IT team, for example) substantially strengthens the planning process. The principal's role in aligning plans with student characteristics demonstrates the practical implementation of the participatory approach proposed by Jamun et al. (2023) and Muskania and Zulela (2021). At SD Nasima, the planning process also reflects an integration between the school's vision and the demands for 21st-century skills, thereby expanding the literature discourse on transformational leadership in the digital era.

According to the findings of this study, SD Nasima has established a clear and adaptive organizational structure to accommodate technological developments. The division of roles among the IT team, teachers, and administrative staff indicates an effective coordination system, aligning with the findings of Fransisca et al. (2023) and Yaminah et al. (2023). However, this study also discovered communication challenges among teams that impact classroom activities, thereby extending the discussion by Marginingsih et al. (2025), who emphasized the importance of cross-team coordination.

Furthermore, this study signifies that organizational success is determined not only by the structure but also by the principal's ability to manage communication and periodically adjust the organizational framework (Arbiansyah et al., 2024). Therefore, a flexible and dynamic organization becomes a crucial factor in the success of smart school implementation. These findings support earlier arguments about the importance of strategic management in the integration of educational technology (Ansori et al., 2025).

With regard to program implementation, this study points out that the use of digital platforms (e.g., Google Classroom and Zoom) and the adoption of blended learning methods have successfully increased student engagement and learning outcomes. These findings are in line with the studies of Fadli and Pardiyansyah (2022) and Marginingsih et al. (2025). Nonetheless, the context of SD Nasima gives additional dimensions to the successful implementation of the smart school program, namely the active involvement of the principal in platform selection and the continuous support from the IT team. This finding agrees with the argument of Awidi and Paynter (2024) on the significance of managerial support in the effectiveness of educational technology.

The adoption of flipped classroom models and the use of interactive technologies (such as smartboards) illustrate deliberate efforts to tailor learning to students' learning styles and the needs for 21st-century curricula (Rosmini et al., 2024; Silvester et al., 2022). In this regard, SD Nasima demonstrates that technology is not merely a supporting tool; it is also an integral component of a dynamic and student-centered learning, in line with modern constructivist learning theories.

Supervision of the digital transformation process at SD Nasima reveals an innovative approach that utilizes technology to enhance efficiency and transparency. At SD Nasima, program monitoring is not conducted by the principal alone; instead, it involves teachers, the IT team, and parents. This indicates that the digital supervision model at SD Nasima is collaborative and data-driven, supporting the findings of Kharismawati et al. (2023) and Nur and Junaris (2023), who emphasized the importance of digital system-based evaluations.

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Moreover, this study shows that evaluation functions not only as performance monitoring but also as a reflective tool to enhance learning effectiveness and encourage evidence-based decision-making. By involving multiple stakeholders in data collection and analysis, SD Nasima has successfully created an adaptive and participatory supervision ecosystem, surpassing conventional top-down supervisory approaches (Pruwodidodo et al., 2023; Wardhani & Krisnani, 2020).

While providing valuable insights into the successful implementation of the smart school program at SD Nasima, the findings of this study also highlight several challenges that resonate with broader issues in digital transformation within education. First, the optimal use of learning platforms can be restricted by variations in teachers' digital proficiency, thus requiring continuous professional development and peer mentoring initiatives. Second, despite the organizational structure's adaptability, differences in technological proficiency and communication styles can make it difficult for teams to coordinate, as shown in a prior study by Marginingsih et al. (2025). Third, resource allocation remains a critical concern, particularly in balancing investments between infrastructure development, teacher training, and continuous technical support. These challenges suggest that successful digital transformation is not only about visionary planning and supportive leadership but also about sustained capacity building and equitable resource distribution.

Overall, this discussion integrates field findings with relevant literature, highlighting both the empirical and theoretical contributions of the case study at SD Nasima. The smart school management approach through digital transformation implemented by SD Nasima can serve as a replicable and scalable model for other primary school contexts, particularly in combining strategic planning, adaptive organizational structures, sustainable technology implementation, and data-driven supervision.

CONCLUSION

Fundamental Finding: The successful implementation of smart school initiatives through digital transformation at SD Nasima is fundamentally driven by the integration of four core management functions: planning, organization, implementation, and supervision. Effective planning, including the development of a digital curriculum and continuous teacher training, serves as a solid foundation for digital learning. Organizational clarity through role-based team structures fosters collaboration among stakeholders. Furthermore, the application of technological tools, such as Learning Management Systems (LMS), smartboards, and blended learning, enhances the interactivity and efficiency of the learning process, while constant supervision by multiple parties ensures the sustainability and effectiveness of the digitalization efforts. **Implication:** These findings suggest that digital transformation in elementary schools goes beyond a mere technology adoption; it represents a holistic and strategic management process that requires human resources preparedness, visionary leadership, and adaptive monitoring systems. The digital transformation model implemented at SD Nasima can serve as a practical reference for other schools aiming to integrate technology contextually and sustainably. To do so, schools must prioritize capacity-building for teachers, establish strong communication frameworks within and across teams, and implement data-driven supervision mechanisms to ensure meaningful improvements in educational quality. **Limitation:** While offering profound insights, this study still has several limitations. First, because this case study only examined an institution, the

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findings might not apply to schools with different socioeconomic, cultural, or geographic conditions. Second, the qualitative approach, while being rich in context, has a limited ability to quantify the direct impacts of digital transformation on student academic achievement. Third, the analysis of long-term changes in digital school management is not possible due to this study's short timeframe. Lastly, this study did not explore in detail the context of external policies, including the potential role of national education regulations in supporting or hindering digital transformation. **Future Research:** To present more generalizable findings, future studies should involve multiple schools across diverse geographic and demographic backgrounds. A mixed-methods approach that combines qualitative and quantitative data is recommended to capture digital transformation's processes and outcomes, including its effects on student performance. Longitudinal studies are also necessary to observe the sustained impacts of digital transformation on learning culture, school governance, and community engagement. Furthermore, investigating the role of education policies and government support mechanisms is essential to assessing the long-term viability and scalability of smart school programs in Indonesia's elementary education system.

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