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Enhancing Teacher Performance through Digital-Based Principal Supervision in Elementary Schools

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A B S T R A C T

This study examines the effectiveness of digital-based principal supervision in improving teacher performance at elementary schools in Pidie District, Aceh. Using a qualitative descriptive approach, data were collected through interviews, observations, and document analysis involving three principals and nine teachers. Findings show that digital platforms such as Platform Merdeka Mengajar (PMM) and Ruang GTK enhance supervision by improving feedback, planning, and technology integration in teaching. However, challenges such as limited internet access, digital literacy gaps, and lack of devices were identified. Principals addressed these through mentoring and offline support. The study concludes that digital-based supervision is effective when supported by infrastructure and leadership, and recommends a blended model combining digital and traditional approaches to improve sustainability and impact.

INTRODUCTION

Education is one of the fundamental pillars in the development of a nation. In Indonesia, education serves as a strategic tool to create an independent, competitive, and morally grounded generation. This is reflected in Article 31, Paragraph 3 of the 1945 Constitution, which mandates that the government is responsible for organizing a national education system to enhance faith, piety, and noble character. The national education system is further elaborated in Law No. 20 of 2003, which emphasizes the importance of quality education as a means of achieving national goals (Ministry of Education and Culture, 2003). At the heart of these efforts is the role of teachers, whose performance significantly influences the quality of learning outcomes and student achievement.

To improve teacher performance, educational institutions must implement effective management strategies, including supervision. School supervision is a key managerial function that supports teacher development through structured monitoring, guidance, and evaluation. According to Suhardan (2019), educational supervision aims to enhance teaching effectiveness by providing professional support and continuous development for educators. Supervision conducted by school principals plays a pivotal role in ensuring that teaching practices meet pedagogical and professional standards, particularly in elementary schools where foundational learning is critical.

However, conventional supervision models often encounter practical challenges, such as limited interaction time, administrative overload, and inconsistent feedback mechanisms. Recent studies have highlighted the tendency of principals to prioritize administrative documentation over instructional development, reducing the effectiveness of supervision (Hanum, 2024; Setyawan & Syamsuryawati, 2023). In response to these limitations, digital-based supervision has emerged as a promising alternative. By leveraging platforms such as the "Merdeka Mengajar" platform and Ruang GTK, principals can conduct performance evaluations, provide timely feedback, and facilitate teacher training in a more efficient and structured manner (Sutrisno et al., 2024).

Digital supervision not only improves transparency and accountability but also offers flexibility in implementation. Principals can remotely monitor teacher activities, share instructional resources, and engage in collaborative planning sessions. This is particularly valuable in regions like Pidie District, where schools often face infrastructural and geographical constraints. Prestiadi et al. (2024) found that digital-based supervision significantly enhanced teacher competence, fostered collaboration, and promoted sustained professional development. However, its effectiveness depends on several factors, including digital literacy, internet accessibility, and institutional readiness.

Therefore, this study aims to explore how digital-based supervision by school principals can be effectively implemented to improve teacher performance in elementary schools in Pidie District. It focuses on identifying strategies, challenges, and solutions associated with the use of digital tools in supervisory practices. The findings of this research are expected to provide practical insights for school leaders and policymakers in optimizing digital

supervision to elevate the quality of primary education in rural and semi-urban contexts.

LITERATURE REVIEW

The Role of School Supervision in Education

Supervision in education is a managerial activity that supports teachers in achieving professional growth, improving teaching practices, and enhancing student learning outcomes. According to Glickman et al. (2018), educational supervision is defined as a process that helps teachers improve instruction through collaborative reflection, coaching, and feedback. It serves as a developmental tool rather than merely an evaluative mechanism. Supervision that is well-planned and consistently implemented helps create a culture of continuous improvement in schools.

In the Indonesian context, educational supervision is guided by Permendiknas No. 13 of 2007, which states that school principals must possess supervisory competence, including the ability to plan, implement, and follow up on supervision. Effective supervision should go beyond administrative tasks and focus on pedagogical guidance that directly impacts teacher performance (Suhardan, 2019). This is especially important in elementary education, where teachers lay the foundation for students' lifelong learning.

Digital Transformation in Educational Supervision

The rapid advancement of technology has introduced new paradigms in school management and teacher development, including digital-based supervision. Digital tools enable school principals to overcome limitations of time and location by using platforms such as Google Classroom, Zoom, Platform Merdeka Mengajar (PMM), and Ruang GTK to monitor and support teachers' instructional practices. As stated by Addini et al. (2022), digital supervision improves efficiency, transparency, and data-driven decision-making in school settings.

Research by Sutrisno et al. (2024) emphasized that digital-based supervision allows for timely feedback, real-time observations, and greater opportunities for teacher collaboration. Moreover, digital supervision creates documentation trails that help assess long-term performance trends and professional development needs. However, it also requires sufficient digital literacy and infrastructure to be implemented effectively.

3. Impact of Digital Supervision on Teacher Performance

Digital supervision has been shown to positively affect teacher performance, especially when combined with ongoing professional development. Studies by Prestiadi et al. (2024) and Nugroho & Hidayati (2023) revealed that digital platforms enhanced teachers' technical skills, instructional planning, and student engagement. For instance, the use of the Aplikasi Supervisi Akademik (ASA) helped principals conduct structured evaluations and follow-up support sessions more effectively than traditional approaches.

Teachers who receive constructive feedback through digital tools are more likely to reflect on their teaching, adapt strategies, and collaborate with peers.

Moreover, the flexibility of asynchronous feedback allows for personalized professional development that accommodates teachers' schedules and learning preferences (Kurniadi & Ismanto, 2025). This personalization boosts teacher motivation and self-efficacy.

Challenges in Implementing Digital-Based Supervision

Despite its advantages, the implementation of digital supervision presents several challenges, particularly in rural and under-resourced areas. Limited access to reliable internet, lack of digital devices, and low levels of digital literacy among educators hinder its adoption (Hanum, 2024). Moreover, some principals may still prioritize administrative compliance over meaningful pedagogical support, leading to minimal improvements in teaching quality.

There is also resistance to change among teachers who are unfamiliar or uncomfortable with digital tools. According to Warhamni et al. (2024), successful implementation of digital supervision requires organizational readiness, targeted training, and a shift in school culture towards innovation and continuous learning. Therefore, capacity-building programs for both principals and teachers are critical.

Theoretical Framework Supporting Digital Supervision

The implementation of digital-based supervision is supported by theories such as Transformational Leadership Theory and Technological Pedagogical Content Knowledge (TPACK). Transformational leadership emphasizes inspiring and motivating staff to achieve higher levels of performance and adaptability (Bass & Riggio, 2006). In digital supervision, principals act as visionary leaders who guide teachers through technology integration in supervision practices.

On the other hand, the TPACK framework provides insight into how educators can effectively integrate technology, pedagogy, and content knowledge. Supervisors equipped with TPACK can offer more meaningful feedback and model effective digital teaching practices (Mishra & Koehler, 2006). Together, these theories offer a robust foundation for understanding how digital supervision can be systematically integrated into educational leadership.

METHODOLOGY

Research Design

This study employs a qualitative descriptive research design to explore how digital-based supervision conducted by school principals influences teacher performance in elementary schools. A qualitative approach was chosen because it allows for an in-depth understanding of the context, perspectives, and experiences of participants. According to Creswell (2018), qualitative research is particularly effective when investigating complex social phenomena within their real-life context. This approach aligns with the study's aim of capturing nuanced insights into the implementation and impact of digital supervision in a school setting.

Research Setting and Participants

The research was conducted in three elementary schools located in Pidie District, Aceh Province, Indonesia, specifically: SDN 1 Peukan Pidie, SDN 4 Peukan Pidie, and SDN 1 Sanggeu. These schools were selected through purposive sampling, based on the criteria that they had begun implementing digital supervision practices and were accessible to the researcher. Participants in this study consisted of three school principals, each of whom served as the primary supervisor responsible for implementing digital-based supervision tools in their respective schools. These principals were selected based on their active use of platforms such as Platform Merdeka Mengajar (PMM) and Ruang GTK to carry out instructional supervision tasks, including classroom observations, feedback delivery, and performance evaluations.

In addition to the principals, the study also involved nine classroom teachers from grades 1 through 6. These teachers were purposefully chosen to represent a variety of experience levels, teaching backgrounds, and subject specializations. Their inclusion provided a comprehensive perspective on how digital supervision practices affected instructional performance across different teaching contexts. Together, the principals and teachers offered valuable insights into both the administrative and practical dimensions of digital supervision in elementary education.

All participants provided verbal and written consent prior to data collection, and ethical guidelines for research with human subjects were strictly followed.

Data Collection Techniques

Data were collected using three primary qualitative techniques to ensure a comprehensive understanding of the digital supervision process. First, semi-structured interviews were conducted with both school principals and teachers. These interviews aimed to explore participants' experiences, perceptions, and challenges related to the implementation of digital-based supervision. Guided by open-ended questions, the interviews were audio-recorded and later transcribed for analysis, allowing for flexibility while maintaining a consistent focus across interviews.

Second, the researcher conducted observations of classroom activities and supervisory practices, paying close attention to how digital tools such as Platform Merdeka Mengajar (PMM) and Ruang GTK were utilized in real-time. Field notes were used to capture key behaviors, interactions, and strategies employed by both principals and teachers during the supervision process.

Third, document analysis was carried out to support and triangulate the data gathered from interviews and observations. Documents reviewed included supervision records, lesson plans, digital performance evaluations, and professional development documentation. These materials offered objective evidence of how digital supervision was structured and applied in practice.

Together, these methods produced a **rich and triangulated dataset**, enhancing the credibility of the findings and enabling a deeper contextual understanding of how digital-based supervision influences teacher performance in elementary schools.

Research Instruments

The research instruments used in this study were carefully developed to align with the study's objectives and ensure the validity of the data collected. First, interview guides were created separately for principals and teachers. These guides focused on key themes such as the frequency of digital supervision, the use of supervision platforms, the nature and timing of feedback provided, and participants' perceptions of the overall impact on teaching performance. This allowed the interviews to remain structured while also accommodating in-depth responses.

Second, the study employed observation checklists that were used during classroom visits and supervisory sessions. These checklists targeted specific indicators such as the integration of digital tools in instruction, teacher behavior in the classroom, and the interaction between teachers and supervisors during the supervision process.

Third, a document analysis protocol was used to systematically examine supervision-related documents, including reports, lesson plans, performance evaluations, and records of digital engagement. The purpose was to assess the completeness, consistency, and extent of digital integration in these documents.

To ensure their effectiveness, all instruments were pilot-tested in a school outside the primary research sample. Feedback from this pilot testing phase was used to improve the clarity, reliability, and practical relevance of each instrument before data collection began in the main study locations.

Data Analysis

Data analysis in this study followed the Miles and Huberman (1994) model of qualitative data analysis, which involves three interrelated steps: data reduction, data display, and conclusion drawing and verification. During the data reduction phase, transcripts from interviews and field notes from observations were carefully reviewed, organized, and coded into key thematic categories that aligned with the research objectives such as implementation strategies, perceived challenges, and the impact of digital supervision on teacher performance.

Following this, the data were displayed using various tools including matrices, charts, and diagrams, which allowed for the visualization of patterns, relationships, and emerging themes across different data sources. This helped the researcher to systematically compare responses from different schools and participant groups.

In the final step, conclusion drawing and verification, themes were interpreted and analyzed for deeper meaning, relevance, and internal consistency. To enhance the credibility of the findings, conclusions were continuously validated through member checking, where participants were asked to review and confirm the accuracy of their interpreted responses. The overall analysis focused on identifying clear, evidence-based themes that illustrated both the effectiveness and the challenges of digital-based supervision in enhancing teacher performance in elementary schools.

Trustworthiness and Validity

To ensure the credibility and trustworthiness of the research findings, several validation strategies were employed throughout the research process. First, triangulation was applied by collecting data through multiple sources namely interviews, observations, and document analysis. This approach allowed the researcher to cross-verify information and strengthen the reliability of the conclusions drawn.

Second, member checking was used to enhance the authenticity of the data. Participants were provided with summaries of their interview responses and asked to review them for accuracy, ensuring that their perspectives were correctly interpreted and represented.

Third, the researcher engaged in peer debriefing, where the emerging findings and interpretations were discussed with academic peers and thesis supervisors. These discussions served to challenge assumptions, reduce personal bias, and refine analytical interpretations.

Lastly, an audit trail was maintained in the form of a detailed research journal. This journal documented all key decisions, methodological adjustments, and reflective notes taken during the study. Together, these strategies contributed to a rigorous research process and strengthened the overall validity of the study's results.

RESEARCH RESULT

This section presents the findings from interviews, observations, and document analyses conducted in three elementary schools: SDN 1 Peukan Pidie, SDN 4 Peukan Pidie, and SDN 1 Sanggeu. The results are organized into three key themes: implementation of digital supervision, perceived impact on teacher performance, and challenges encountered.

Implementation of Digital-Based Supervision

All three school principals utilized digital platforms such as the Platform Merdeka Mengajar (PMM) and Ruang GTK to conduct supervisory tasks. These included classroom observations using video recordings, digital feedback through the platform, and monthly virtual training workshops. The following table summarizes the average monthly frequency of digital supervision activities in each school:

Table 1. Frequency Of Digital Supervision Activities

School	Classroom Observation	Feedback Sessions	Training Workshops
SDN 1 Peukan Pidie	6	5	2
SDN 4 Peukan Pidie	5	5	2
SDN 1 Sanggeu	4	4	1

This table 1 indicates that SDN 1 Peukan Pidie had the most frequent supervision interactions, with 6 classroom observations and 5 feedback sessions per month. In contrast, SDN 1 Sanggeu showed slightly lower activity due to limited infrastructure and fewer trained personnel.

Perceptions of Teachers Toward Digital Supervision Tools

Teachers expressed generally positive views regarding the integration of digital tools in supervision. The platforms were seen as user-friendly and supportive of professional development. Feedback was received in a more structured and timely manner than before. The following table 2 reflects average scores from teacher interviews using a 1–5 Likert scale:

Table 2. Teacher Perception of Digital Supervision Tools

Aspect	Average Score
Ease of Use	4.3
Usefulness	4.5
Feedback Timeliness	4.1
Professional Development Support	4.2
Overall Satisfaction	4.4

Most teachers rated Usefulness (4.5) and Overall Satisfaction (4.4) very highly, which suggests the digital platforms were successful in delivering relevant and practical supervisory feedback.

Effect of Supervision on Teacher Performance

A comparison of teacher performance before and after the implementation of digital-based supervision showed significant improvement, particularly in the use of technology and planning of lessons. Data triangulated from document analysis and classroom observations revealed that the average scores in four performance categories increased by more than 0.7 points on a 5-point scale. This data is visually summarized below in figure 1:

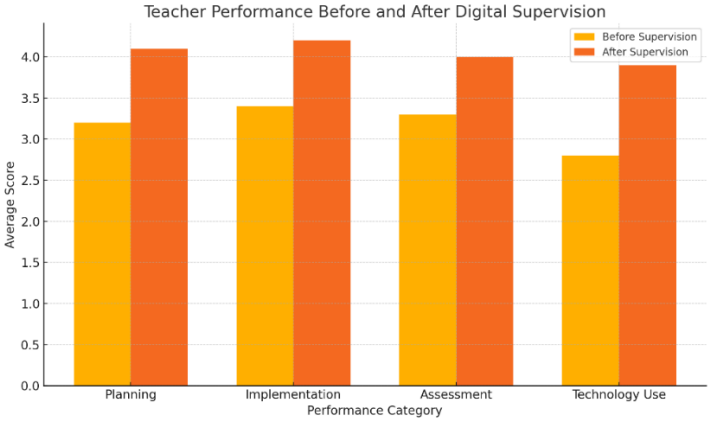

Figure 1. Teacher Performance Befor and After Digital Supervision

The figure 1 demonstrates that the use of technology in teaching improved most significantly (from 2.8 to 3.9), suggesting that digital supervision encouraged teachers to adopt and integrate tech-based learning strategies.

Challenges Identified

Despite the notable successes of digital-based supervision, several challenges emerged during its implementation. One of the primary issues was

inconsistent internet connectivity in SDN 1 Sanggeu, which hindered the ability to conduct real-time feedback sessions and limited access to online supervisory tools. Additionally, digital literacy gaps, particularly among senior teachers, posed difficulties in navigating supervision platforms effectively, necessitating further training and support. Another significant constraint was the limited availability of devices, such as laptops or smartphones, which restricted some teachers' ability to engage fully in the supervision process.

In response to these challenges, school principals took proactive steps. They introduced peer mentoring programs to encourage knowledge sharing among teachers, organized offline workshops to supplement online activities, and submitted proposals for infrastructure improvements to the local education authorities. These efforts were aimed at creating more equitable conditions for all teachers to benefit from digital supervision and to enhance its overall effectiveness across schools.

DISCUSSION

The results of this study indicate that digital-based supervision has a significant positive impact on teacher performance in elementary schools within Pidie District. This aligns with previous research asserting that instructional supervision, when properly implemented, can be a powerful tool for improving teaching practices and student outcomes (Glickman et al., 2018). The integration of digital tools such as Platform Merdeka Mengajar (PMM) and Ruang GTK has allowed principals to perform supervisory duties with greater efficiency, transparency, and flexibility.

One of the most notable findings was the improvement in teacher performance, particularly in lesson planning, the integration of technology into the classroom, and assessment strategies. These results are consistent with the work of Sutrisno et al. (2024), who reported that digital supervision enhances teacher competency by facilitating timely and data-driven feedback. Additionally, the digital format encourages reflective practice among teachers, which is essential for continuous professional growth (Darling-Hammond et al., 2017).

The positive perception of teachers towards the digital supervision process especially in terms of usefulness and satisfaction indicates a growing readiness among educators to embrace technological innovations in their professional development. This finding supports the conclusions of Prestiadi et al. (2024), who found that digital platforms foster collaboration, motivation, and sustained teacher engagement. Furthermore, the structured documentation enabled by digital tools contributes to a more systematic and measurable approach to supervision, addressing longstanding issues of subjectivity and inconsistency in traditional models (Kurniadi & Ismanto, 2025).

However, the study also revealed persistent challenges that hinder the full potential of digital supervision, particularly in resource-limited schools. Inconsistent internet connectivity, limited access to digital devices, and varying levels of digital literacy among teachers especially older staff were among the key obstacles. These issues are not unique to Pidie; they reflect broader systemic

challenges in the digitalization of education in rural areas (Hanum, 2024). As noted by Warhamni et al. (2024), successful implementation of digital supervision requires not only technical tools but also capacity-building initiatives and ongoing institutional support.

The role of school leadership was found to be critical in navigating these challenges. Principals who actively supported their staff through peer mentoring, offline workshops, and advocacy for improved infrastructure demonstrated greater success in sustaining digital supervision. This observation reinforces the argument by Leithwood et al. (2020) that transformational leadership characterized by support, vision, and capacity-building is essential for successful technology integration in schools.

In light of these findings, it is clear that digital-based supervision holds great promise for improving teacher performance, especially when supported by strategic leadership and robust infrastructure. However, for digital supervision to achieve its full potential, it must be embedded within a broader ecosystem that includes ongoing training, inclusive access to technology, and supportive policy frameworks. A hybrid approach that combines digital and conventional methods may offer the most practical and sustainable solution in diverse educational contexts.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study concludes that digital-based supervision conducted by school principals significantly contributes to improving teacher performance in elementary schools. By leveraging platforms such as Platform Merdeka Mengajar (PMM) and Ruang GTK, principals were able to implement supervision that was more systematic, timely, and data-driven. Teachers showed marked improvement in critical areas such as lesson planning, instructional delivery, assessment practices, and the integration of digital technology into the classroom.

The use of digital tools also enhanced the transparency and accountability of the supervision process, while promoting more reflective teaching practices. Teachers responded positively to the digital format, appreciating the timely feedback and professional support it provided. These improvements reflect the potential of technology to transform traditional supervisory practices and promote professional growth.

However, several challenges were also identified, particularly related to infrastructure, digital literacy, and device accessibility, especially in rural schools like SDN 1 Sanggeu. Without consistent internet access and adequate digital tools, the implementation of digital supervision remains uneven. Moreover, differences in teachers' familiarity with technology underscore the need for targeted training and capacity building.

Overall, while digital-based supervision is not a complete replacement for traditional methods, it serves as a powerful complement that enhances the overall effectiveness of school leadership and instructional improvement. The success of such initiatives depends not only on technology but also on leadership, training, and institutional readiness.

Recommendations

Based on the findings of this research, several recommendations are proposed to support the effective implementation and sustainability of digital-based supervision in elementary education.

For school principals, it is recommended that they continue to develop and institutionalize digital supervision practices by integrating online platforms with traditional, face-to-face coaching methods. This hybrid approach allows for both efficiency and personal interaction, which are essential for instructional development. Principals should also position themselves as digital role models by enhancing their own technological competencies, demonstrating leadership in the adoption and effective use of educational technologies.

For teachers, active participation in digital training programs is essential. Teachers are encouraged to view technology not as a challenge but as a valuable tool for professional growth and classroom innovation. To address digital literacy gaps, especially among more senior educators, peer collaboration and mentoring within schools can provide ongoing support and foster a shared culture of learning and adaptation.

For the Department of Education (Dinas Pendidikan), it is crucial to prioritize investment in digital infrastructure, especially in underserved or rural areas. This includes improving internet connectivity, ensuring schools have access to appropriate digital devices, and providing continuous, structured training for both teachers and school leaders. Such investments are foundational to making digital supervision equitable and sustainable across the region.

For future researchers, it is recommended to conduct further studies that examine the long-term effects of digital supervision, particularly its influence on student learning outcomes. Comparative research between rural and urban schools would also be valuable in identifying context-specific challenges and best practices in implementing digital supervision.

For policymakers, there is a need to design and promote blended supervision models that combine the benefits of digital tools with traditional supervision practices. This approach will allow schools to be more flexible and adaptive, while ensuring that the supervision system remains inclusive, sustainable, and responsive to diverse educational settings and teacher needs.

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