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Digital Leadership Transformation of School Principals in Enhancing Teachers' Professional Competence in Elementary Schools

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ABSTRACT. The rapid digital transformation of education has significantly altered the roles and responsibilities of school principals, requiring them to adopt digital leadership practices that support teachers' professional growth and instructional innovation. Despite the increasing importance of digital leadership in educational settings, limited studies have explored how principals transform their leadership practices to enhance teachers' professional competence, particularly in elementary schools. Therefore, this study aimed to investigate the transformation of principals' digital leadership in improving teachers' professional competence in elementary school environments. Specifically, the study examined the forms of digital leadership transformation, the strategies employed by principals, the supporting and inhibiting factors influencing the transformation process, and its impact on teachers' professional competence. This study employed a qualitative approach using a case study design. Data were collected through participant observation, in-depth interviews, and documentation analysis involving principals, teachers, and educational staff. The study was conducted from January to April 2026. Data were analyzed using the interactive model of Miles, Huberman, and Saldaña, which includes data reduction, data display, and conclusion drawing and verification. The findings revealed that principals transformed digital leadership through the integration of digital communication platforms, Google Workspace, school social media, Interactive Flat Panel (IFP) technology, Chromebook-supported learning, Canva, CapCut, and the Ruang Belajar GTK platform. The transformation was further strengthened through collaborative professional learning communities, peer mentoring systems, technology-based supervision, and motivational leadership practices. Supporting factors included teachers' willingness to learn, collaborative school culture, and principal support, while inhibiting factors comprised limited technological infrastructure, unequal digital competence, unstable internet connectivity, and administrative burdens. The transformation positively enhanced teachers' digital literacy, instructional creativity, reflective teaching practices, communication competence, and continuous professional development. These findings imply that successful digital leadership transformation requires not only technological resources but also adaptive leadership, collaborative organizational culture, and sustained professional learning support.

Keywords: *Digital leadership, educational technology, elementary school, principal leadership, teacher's professional competence*

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INTRODUCTION

In the contemporary era marked by technological disruption and digital acceleration, educational institutions are confronted with increasingly complex demands in improving instructional quality and developing teachers' professional capabilities. The emergence of digital technology has reshaped educational administration, teaching practices, and professional learning

systems across schools (Michael Fullan, 2014). As a result, school principals are expected to adopt responsive and progressive leadership approaches capable of integrating digital innovation into educational activities effectively. Digital leadership has therefore become a critical component of school management because it supports institutional collaboration, strengthens communication systems, promotes instructional creativity, and facilitates continuous professional growth among teachers (Eric Sheninger, 2019). Within this framework, the transformation of principals' digital leadership is considered essential for establishing adaptive and technology-oriented learning environments (Tony Bush & Derek Glover, 2021).

Numerous recent studies have demonstrated that digital leadership contributes positively to institutional effectiveness, teacher productivity, and organizational development in educational settings. Previous findings revealed that principals who utilize digital leadership practices successfully encourage the integration of technology into classroom instruction, improve teachers' pedagogical competence, and foster collaborative professional learning communities (Sara Dexter & Jayson W. Richardson, 2020). In addition, digital leadership has been associated with the implementation of innovative supervision systems, data-driven educational decision making, and the development of sustainable instructional practices within schools (Bruce J Avolio et al., 2021). Nevertheless, several studies also identified various obstacles in implementing digital leadership, including inadequate technological facilities, low digital competence among educators, organizational resistance to change, and disparities in access to educational technology (Alma Harris & Michelle Jones, 2022). These conditions suggest that the effectiveness of digital transformation is strongly influenced by the principal's managerial and leadership capacity in coordinating technology-based educational programs comprehensively.

Although scholarly discussions concerning digital leadership in education continue to expand, many previous studies have concentrated mainly on digital infrastructure, online learning implementation, and technological integration within instructional systems (Asep Suryadi & Bambang Santoso, 2022). Research on educational digitalization has also predominantly emphasized operational and technical aspects of technology implementation rather than leadership transformation processes that directly influence teacher professionalism (Intan Rahmawati, 2024). Comparatively limited research has explored how school principals transform leadership practices specifically to strengthen teachers' professional competence. This situation demonstrates the existence of a research gap regarding the strategic role of principals' digital leadership in supporting sustainable professional development among teachers.

This study seeks to address the existing research gap by investigating the transformation of school principals' digital leadership in enhancing teachers' professional competence within elementary school environments. Previous research by Susanti (2025) examined transformational leadership in improving teacher motivation and performance at the senior high school level and found that principals played important roles in supporting digital adaptation despite challenges related to infrastructure and teachers' digital competence (Susanti, 2025). Similarly, Ridlo (2024) explained that principals' transformational leadership contributes to strengthening teachers' competence and performance through continuous professional development in the digital era (Ridlo IAI Al Khoziny Buduran Sidoarjo, 2024), while Kasim and Surya (2025) found that digital leadership positively influences instructional innovation and technology integration in elementary schools (Kasim & Surya, 2025). In addition, Zai et al. (2024) emphasized that digital leadership transformation supports collaborative and adaptive school cultures in the digital era (Zai et al., n.d.). However, limited studies specifically examine how principals transform digital leadership practices to enhance teachers' professional competence at the elementary school level. Therefore, this study focuses on technology-oriented supervision, collaborative communication, and sustainable professional development as efforts to improve teacher professionalism and educational quality in the digital era.

Accordingly, this study aims to: (1) examine the forms of digital leadership transformation in elementary schools, (2) analyze the strategies implemented to improve teachers' professional competence in elementary schools, (3) identify the supporting and inhibiting factors influencing digital leadership transformation in strengthening teachers' professional competence in elementary schools, and (4) investigate the impact of digital leadership transformation on improving teachers' professional competence in elementary schools. The unit of analysis in this study consists of school principals, teachers, and educational management activities related to the implementation of technology-based leadership practices within the school environment.

METHOD

This study employed a qualitative approach with a case study design to investigate the transformation of school principals' digital leadership in enhancing teachers' professional competence within the educational environment. The qualitative method was selected because it enables researchers to obtain comprehensive and contextual understanding regarding leadership practices, professional development processes, and technology integration within natural school settings (Adhi Kusumastuti & Ahmad Mustamil Khoiron, 2019). Furthermore, qualitative inquiry allows researchers to interpret social phenomena based on participants' experiences and perspectives within real-life contexts (John W. Creswell, 2016). The case study design was considered appropriate because it facilitates an in-depth exploration of leadership phenomena, organizational dynamics, and participants' experiences related to the implementation of digital leadership in schools (Robert K. Yin, 2018). In addition, case study research enables the investigation of complex educational issues within specific institutional settings (Sharan B. Merriam & Elizabeth J. Tisdell, 2016). Therefore, this methodological approach provides a reliable and valid foundation for generating detailed insights into digital leadership transformation and teacher professionalism in contemporary education.

The research was conducted at an educational institution that actively implemented technology-based educational management and digital learning practices. The school was purposively selected because it demonstrated strong commitment toward digital transformation through the integration of technology in instructional supervision, professional development programs, and school management activities (Philip Hallinger, 2011). Digital leadership practices also support innovation and organizational change within educational institutions (Eric Sheninger, 2019). The study was carried out over a four-month period, from January to April 2026, including preparation, data collection, data verification, and analysis stages.

The researcher's presence played an active role throughout the research process as the primary research instrument who directly interacted with participants, observed educational activities, and interpreted the collected data (Lexy J. Moleong, 2017). The main subjects of this study were the school principal and teachers involved in the implementation of digital leadership practices. Supporting informants included educational staff and several stakeholders who contributed information related to technology-based educational management within the school environment. The involvement of multiple participants was intended to strengthen data triangulation and improve the credibility of research findings (Yvonna S. Lincoln & Egon G. Guba, 1985).

The data collection process employed participant observation, in-depth interviews, and documentation analysis (Sugiyono, 2019). In-depth qualitative data collection techniques are essential for obtaining detailed and meaningful information from participants (Michael Quinn Patton, 2015). Participant observation was conducted to examine how principals implemented digital leadership practices in managing educational activities, supervising teachers, and integrating technology into school management. In-depth interviews were carried out with principals, teachers, and educational staff to explore their experiences, perceptions, and responses regarding digital leadership transformation and teacher professional development. In addition, documentation analysis involved reviewing institutional documents such as digital program plans, supervision

reports, professional training records, school policies, and other supporting documents related to digital leadership implementation. These various techniques enabled the researcher to obtain comprehensive and interconnected data concerning the research focus.

The instruments utilized in this study included interview guidelines, observation sheets, and documentation checklists designed based on the objectives and focus of the research. Each instrument was systematically developed to ensure consistency and relevance during the data collection process. The data analysis procedure adopted the interactive model proposed by Huberman and Saldaña, consisting of data reduction, data display, and conclusion drawing or verification (Matthew B. Miles et al., 2014). Data reduction was performed by selecting, categorizing, and coding relevant information related to digital leadership transformation and teachers' professional competence. Data display was conducted through descriptive narratives and thematic interpretation to identify patterns and relationships among findings. Meanwhile, conclusion drawing and verification were continuously implemented throughout the research process through data comparison, participant confirmation, and triangulation techniques.

To ensure the validity and trustworthiness of the findings, this study applied the criteria proposed by Lincoln and Guba, namely credibility, transferability, dependability, and confirmability (Yvonna S. Lincoln & Egon G. Guba, 1985). Credibility was achieved through prolonged engagement, persistent observation, source triangulation, technique triangulation, and member checking with participants (John W. Creswell, 2016). Transferability was maintained by presenting detailed descriptions regarding the research setting, participants, and contextual conditions of the study. Dependability was ensured through systematic documentation of all research procedures and analytical processes. Meanwhile, confirmability was established through reflective interpretation, audit trails, and continuous evaluation of data consistency throughout the research process.

Overall, the methodological framework employed in this study provided a rigorous and trustworthy approach for understanding how the transformation of school principals' digital leadership contributes to enhancing teachers' professional competence. The combination of contextual exploration, multiple data sources, and systematic validation procedures ensured that the findings accurately represented the actual conditions and experiences occurring within the educational environment.

RESULT AND DISCUSSION

Result

Transformation of Principals' Digital Leadership in Elementary Schools

The findings revealed that the transformation of principals' digital leadership in elementary schools was implemented gradually according to institutional conditions, teachers' readiness, and available technological resources. The principal assumed multiple strategic roles as an educational leader, instructional supervisor, motivator, facilitator, innovator, and collaborator in promoting technology integration and strengthening teachers' professional competence. The transformation process extended beyond technology adoption and emphasized the development of collaborative professional culture, reflective teaching practices, and continuous professional learning.

The study identified six major forms of digital leadership transformation implemented by principals, as summarized in Table 1.

Table 1 Forms of Principals' Digital Leadership Transformation

Dimension	Implementation
Digital Communication	WhatsApp Groups, Google Workspace, Google Drive
School Communication and Promotion	Instagram, Facebook, WhatsApp Business
Technology-Based Learning	Interactive Flat Panel (IFP), Chromebook
Digital Learning Media Development	Canva, CapCut
Digital Supervision	Online lesson plans, digital reflections, electronic reports

Professional Development	Ruang Belajar GTK, webinars, virtual workshops

Observation findings indicated that principals integrated digital communication systems into daily school management through WhatsApp groups, Google Workspace, and cloud-based document sharing. These platforms facilitated institutional coordination, instructional consultation, supervision activities, and collaborative communication among teachers. Teachers reported that digital communication accelerated information dissemination and simplified instructional administration processes. Furthermore, digital supervision enabled teachers to submit lesson plans, teaching reflections, assessment reports, and instructional documentation electronically, allowing principals to provide more flexible and continuous feedback.

Another significant transformation involved the utilization of school social media platforms, including Instagram, Facebook, and WhatsApp Business. These platforms were used to disseminate information regarding school programs, student achievements, literacy initiatives, and innovative classroom practices. Teachers actively participated in producing educational content and documenting instructional activities. As a result, teachers gradually improved their competence in developing visual learning materials and educational publications using digital applications such as Canva and CapCut.

Technology integration was also evident in classroom instruction through the use of Interactive Flat Panel (IFP) devices and Chromebook-supported learning. Teachers utilized these technologies to deliver interactive presentations, multimedia learning resources, digital quizzes, and online assessments. Although several teachers initially demonstrated limited confidence in utilizing advanced technological features, continuous guidance from principals and peer support gradually enhanced their digital competence and instructional creativity.

Figure 1. Classroom Learning Observation on Technology-Based Instruction

Observation findings demonstrated that technology-supported instruction increased student participation and encouraged teachers to implement more interactive and student-centered learning approaches. Chromebook devices were primarily utilized for digital assessment, literacy and numeracy activities, assignment management, and classroom administration through Google Workspace integration.

Strategies for Strengthening Teachers' Professional Competence

The findings further revealed that principals implemented various strategic initiatives to improve teachers' professional competence through digital leadership transformation. These strategies are presented in Table 2.

Table 2 Strategies for Improving Teachers' Professional Competence

Strategy	Description	Outcome
Technology-Based Supervision	Online monitoring and continuous feedback	Improved reflective teaching
Professional Learning Communities	Collaborative discussions and knowledge sharing	Enhanced collaboration
Peer Mentoring	Assistance among teachers in technology use	Faster digital adaptation
Motivational Leadership	Recognition and encouragement	Increased teacher confidence
Online Professional Development	GTK Platform, webinars, workshops	Improved digital literacy

One important strategy involved encouraging teachers to participate in the Ruang Belajar GTK platform, educational webinars, online workshops, and virtual learning communities. Teachers explained that these platforms provided access to updated knowledge regarding differentiated instruction, literacy and numeracy learning, curriculum implementation, classroom management, diagnostic assessment, and educational technology integration.

Motivational leadership practices also played a significant role in supporting digital transformation. Principals consistently provided encouragement, appreciation, and professional recognition to teachers who successfully implemented innovative learning practices. Teachers reported that such recognition enhanced their confidence and willingness to continue developing instructional innovations.

The findings additionally revealed the establishment of collaborative professional learning communities. Through formal meetings, WhatsApp groups, internal workshops, and collaborative reflections, teachers regularly discussed instructional challenges, exchanged digital learning resources, and reflected on classroom practices. These collaborative activities reduced anxiety related to technology adoption and strengthened collective professional learning within schools.

Supporting and Inhibiting Factors of Digital Leadership Transformation

The implementation of digital leadership transformation was influenced by several supporting and inhibiting factors, as presented in Table 3.

Table 3. Supporting and Inhibiting Factors

Supporting Factors	Inhibiting Factors
Teachers' willingness to learn	Limited Chromebook and IFP availability
Collaborative professional culture	Unstable internet connectivity
Principal motivation and support	Disparities in digital competence
Learning communities	Administrative workload
Access to digital platforms	Limited technological infrastructure

The findings showed that teachers' willingness to learn, collaborative relationships among colleagues, motivational leadership from principals, and access to digital learning platforms significantly supported digital transformation initiatives. Teachers emphasized that collegial support and collaborative discussions facilitated their adaptation to educational technology integration.

Conversely, several challenges emerged during implementation. Limited technological infrastructure, particularly the availability of Chromebook devices, Interactive Flat Panels, and LCD projectors, constrained technology integration efforts. Internet connectivity issues occasionally disrupted online supervision, digital learning activities, and participation in webinars. Additionally, disparities in teachers' digital competence created varying adaptation rates, with younger teachers generally demonstrating greater confidence in utilizing educational technologies. Nevertheless, principals addressed these challenges through gradual implementation, internal workshops, peer mentoring systems, and continuous professional support.

Impact of Digital Leadership Transformation on Teachers' Professional Competence

The findings demonstrated that principals' digital leadership transformation positively influenced teachers' professional competence across multiple dimensions. Figure 2 illustrates the major impacts identified in this study.

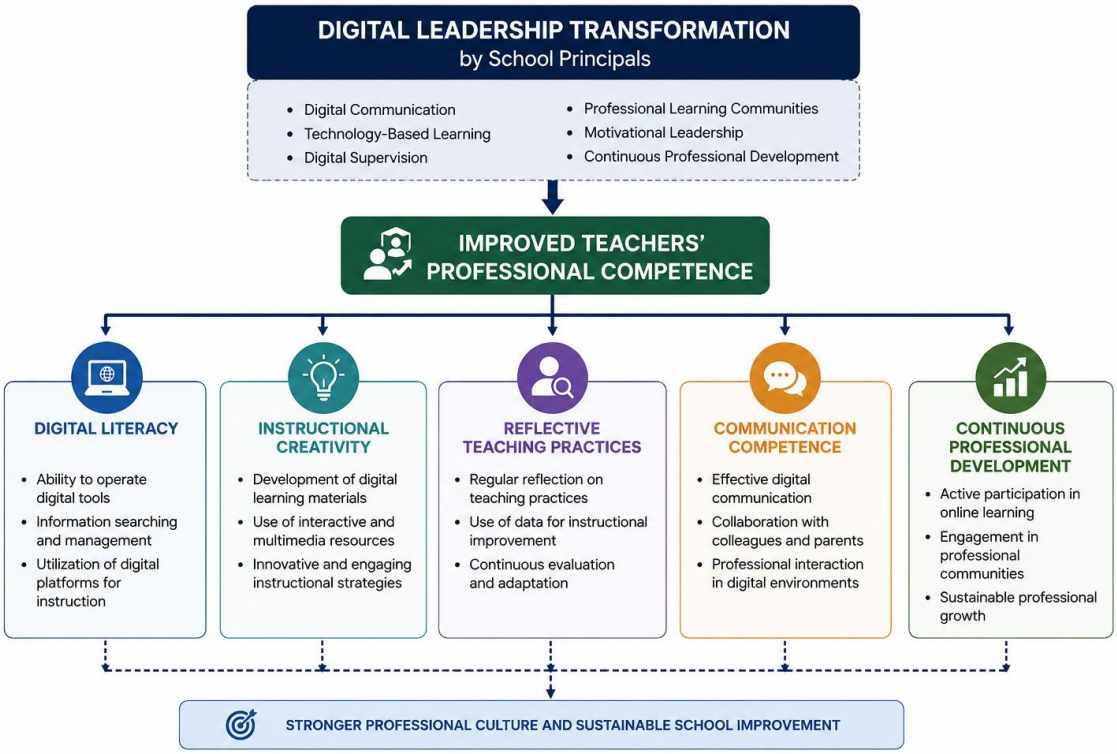

Figure 2. Impact of Principals' Digital Leadership Transformation on Teachers' Professional Competence

Teachers demonstrated substantial improvements in utilizing educational technology, designing digital learning materials, conducting technology-supported assessments, and implementing interactive instructional strategies. Observation findings further indicated increased teacher confidence in integrating multimedia resources and educational applications into classroom learning.

The study also found significant improvements in collaborative professional learning practices. Teachers became more accustomed to discussing instructional challenges, exchanging innovative teaching experiences, and collaboratively solving classroom problems through learning communities and peer mentoring systems. These collaborative interactions strengthened professional solidarity and accelerated digital adaptation throughout the school environment.

Another important impact involved the enhancement of instructional creativity and communication competence. Teachers increasingly explored digital learning resources, visual instructional media, and technology-supported learning activities tailored to students' characteristics and learning needs. Overall, the findings suggest that digital leadership transformation contributed not only to technological competence but also to the development of instructional innovation, collaborative culture, reflective practice, communication skills, and sustainable professional development among elementary school teachers.

Discussion

The findings of this study demonstrate that principals' digital leadership transformation in elementary schools involves not only technology integration within educational management, but also the development of adaptive leadership practices capable of strengthening teachers' professional competence through collaborative and sustainable approaches. This finding supports the opinion of Eric Sheninger who stated that digital leadership requires school principals to create innovative, collaborative, and technology-oriented educational cultures capable of improving instructional quality and professional learning systems (Eric Sheninger, 2019). The findings also align with research conducted by Ridlo which explained that effective school leadership in the digital era strengthens teacher professionalism, encourages collaborative organizational culture, and supports sustainable instructional innovation (Ridlo IAI Al Khoziny Buduran Sidoarjo, 2024).

The findings indicate that principals functioned not only as administrative leaders, but also as motivators, facilitators, supervisors, collaborators, and instructional innovators. This finding strengthens transformational leadership theory proposed by Bass and Riggio, which emphasizes that effective leaders inspire organizational members, encourage innovation, and facilitate professional growth through motivational and collaborative approaches (Bernard M. Bass & Ronald E. Riggio, 2006). Similarly, Rosita and Iskandar found that principals in the digital era are required to become adaptive leaders capable of encouraging teachers' creativity, instructional innovation, and technological adaptation within educational environments (Rosita & Iskandar, 2022).

The implementation of digital supervision practices through online communication platforms and digital document submission demonstrated that principals increasingly utilized technology to strengthen reflective instructional supervision. This finding supports the opinion of Glickman et al who explained that supervision should function as a continuous professional assistance process that improves teachers' instructional competence through reflective evaluation and collaborative mentoring (Carl D. Glickman et al., 2018). In line with this perspective, Nurhasan et al. found that technology-based supervision contributes positively to improving teachers' digital competence, instructional adaptation, and professional development sustainability (Suryati et al., 2023).

The utilization of school social media additionally demonstrates that digital leadership expanded beyond administrative communication into broader dimensions of educational communication, institutional publication, and collaborative professional learning. This finding is consistent with the opinion of Castells who emphasized that digital communication networks strengthen collaboration, information exchange, and organizational adaptability in modern institutions (Manuel Castells, 2010). Furthermore, Silalahi et al. explained that social media utilization within schools supports digital literacy development, collaborative learning cultures, and instructional communication effectiveness among teachers (Albert et al., n.d.).

The findings additionally reveal that the integration of Interactive Flat Panel (IFP) devices and Chromebook-supported learning encouraged teachers to shift toward more interactive and student-centered instructional approaches. This finding strengthens educational technology theory proposed by Mishra and Koehler through the Technological Pedagogical Content Knowledge (TPACK) framework, which explains that technology integration enhances pedagogical effectiveness when combined with appropriate instructional strategies and content mastery (Punya Mishra & Matthew J. Koehler, 2006). Similarly, Kasim and Surya found that principals' digital leadership significantly influences teachers' instructional innovation and technology integration in elementary school learning environments (Kasim & Surya, 2025).

Another important finding concerns the role of digital learning platforms in strengthening teachers' continuous professional development. This finding supports the opinion of Fullan who argued that sustainable educational improvement depends on continuous professional learning and

collaborative capacity building among teachers (Michael Fullan, 2014). In addition, Dhielfitri and Yohamintin emphasized that digital professional development platforms enable teachers to independently improve pedagogical competence, instructional innovation, and digital literacy according to their professional learning needs (Gianluigi Maulana Dhielfitri & Yohamintin, 2025).

The study also demonstrates that motivational leadership became a central component of successful digital transformation implementation. This finding aligns with transformational leadership theory proposed by Burns, which explains that leaders motivate organizational members through inspiration, support, appreciation, and shared professional vision (James MacGregor Burns, 1978). Similarly, Tobondo found that transformational leadership positively influences teachers' professional commitment, instructional motivation, and readiness to adapt toward digital educational innovation(Alfasius Tobondo, 2025).

The creation of open discussion spaces and collaborative learning communities additionally strengthened professional learning cultures within schools. This finding supports the theory of Professional Learning Communities proposed by DuFour and Eaker, which emphasizes that collaborative interaction, reflective dialogue, and shared professional responsibility strengthen teacher competence and instructional quality improvement (Richard DuFour & Robert Eaker, 1998). In line with this theory, Nuraeni et al. explained that collaborative school cultures encourage teachers to exchange instructional experiences, discuss learning challenges, and develop innovative teaching practices collectively(Nuraeni et al., 2025).

The emergence of peer mentoring practices further demonstrates that collaborative professional culture became an important supporting factor in digital transformation implementation. This finding supports Vygotsky's social constructivist perspective which explains that professional learning develops effectively through social interaction, collaboration, and peer assistance processes (Lev S. Vygotsky, 1978). Similarly, Suryati et al. found that collegial mentoring and collaborative leadership significantly support teachers' adaptation toward digital transformation and educational innovation(Suryati et al., 2023).

However, the study also identified several inhibiting factors in the implementation of principals' digital leadership transformation, including limited technological infrastructure, disparities in teachers' digital competence, unstable internet connectivity, and resistance toward educational change. These findings are consistent with Rogers' Diffusion of Innovation Theory (Everett M. Rogers, 2019), which explains that innovation adoption processes are often influenced by technological readiness, organizational support, and individual adaptability toward change. Similarly, Kurniawan et al.(Agus Kurniawan & Lazwardi, 2025) found that limited digital infrastructure and unequal technological competence remain major obstacles in implementing digital transformation within schools.

Overall, this study contributes to the development of educational management science by providing contextual understanding regarding principals' digital leadership transformation within elementary school environments. The findings confirm that meaningful digital transformation can emerge through adaptive leadership, collaborative organizational culture, sustainable professional development, and contextual technology integration capable of strengthening teachers' professional competence and improving educational quality in the digital era.

CONCLUSION

This study demonstrates that the transformation of principals' digital leadership plays a crucial role in enhancing teachers' professional competence in elementary schools. The most significant finding is that successful digital leadership transformation is not primarily driven by the availability of advanced technology, but by principals' ability to create a collaborative professional culture that supports continuous learning, peer mentoring, reflective practice, and instructional innovation. While digital tools such as Google Workspace, school social media, Interactive Flat Panels (IFP), Chromebooks, Canva, CapCut, and the Ruang Belajar GTK platform facilitated the transformation process, the findings reveal that adaptive leadership, motivational support, and

collaborative professional learning communities were the key mechanisms through which teachers improved their digital literacy, instructional creativity, communication competence, and reflective teaching practices. This finding suggests that the human and organizational dimensions of digital transformation may be more influential than technological infrastructure alone.

Academically, this study contributes to the growing body of literature on digital leadership by extending existing perspectives beyond technology integration and administrative efficiency. The findings confirm previous studies emphasizing the importance of digital leadership in supporting educational transformation, while also offering a broader conceptual understanding of digital leadership as a collaborative and capacity-building process. Specifically, this study highlights the role of professional learning communities, peer mentoring systems, and motivational leadership practices as important mediating mechanisms linking principals' digital leadership to teachers' professional competence. Thus, the study provides a contextualized model of digital leadership transformation within elementary school settings that may enrich future theoretical and empirical discussions.

Despite these contributions, this study has several limitations. The research was conducted within a limited number of elementary schools and relied primarily on qualitative data obtained from a specific educational context. Therefore, the findings may not fully represent the diversity of schools in different regions or educational levels. Future studies should involve larger and more diverse samples, incorporate multiple educational contexts, and employ mixed-method or longitudinal research designs to examine the long-term impact of digital leadership transformation. Further research is also needed to investigate the relationships among digital leadership, teacher professionalism, organizational culture, and student learning outcomes in order to provide more comprehensive evidence for educational policy and practice.

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