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## The Principal's Role in Motivating Teachers to Improve Their Pedagogical Competence Through Information Technology

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### ABSTRACT

This study analyzes the role of school principals in enhancing teachers' pedagogical competencies through the use of Information Technology (IT) in public elementary schools in Bukit Batu District. The main focus is on how principals motivate teachers and integrate IT to improve the quality of pedagogical competencies. A qualitative phenomenological approach was used to explore the experiences of principals and teachers related to motivation and the strengthening of competencies through IT. Data were collected through in-depth interviews, participatory observation, and document studies at SD Negeri 005 and SD Negeri 009 in Bukit Batu during the period from May to November 2025. The findings show that principals play a crucial role in enhancing pedagogical competencies through IT, such as initiating training and mentoring. However, challenges such as limited devices, unstable internet access, and teachers' readiness remain major obstacles. Supporting factors include regular training and support from the Education Office, while the main barriers are limited IT facilities, varied teacher skills, and differing motivation levels. To optimize the use of IT, improvements in facilities, more intensive training, and adequate technical support are needed.

## 1. Introduction

Education is a conscious and systematic process that helps individuals develop their full potential. Through education, people are guided to sharpen critical thinking, build character, strengthen moral values, and master skills that are useful both for personal life and social contribution. The ultimate aim is to help individuals reach maturity and independence in carrying out life tasks, encompassing intellectual development, character formation, skills, and social values needed in society and the nation (Hidayat & Abdillah, 2019).

Law of the Republic of Indonesia No. 20 of 2003 on the National Education System defines education as a conscious and planned effort to create learning environments and processes that enable learners to actively develop their potential. This potential

includes spiritual and religious strength, self-control, personality, intelligence, noble character, and skills required for themselves, society, and the state. Through such education, the quality of human resources is expected to improve in terms of knowledge, emotional and spiritual intelligence, creativity, morality, and responsibility (Sumarni et al., 2024). Quality education thus becomes a fundamental pillar for national progress.

Within this framework, teachers hold a strategic position. One of the core competences they must possess is pedagogical competence, as stipulated in Minister of National Education Regulation No. 16 of 2007. Pedagogical competence involves understanding learner characteristics, mastering learning theories and principles of educative instruction, and the ability to design, implement, and evaluate learning. Law No. 14 of 2005 on Teachers and Lecturers further states that teachers must demonstrate four competences: personal, pedagogical, professional, and social. Among these, pedagogical competence plays a central role in managing classroom learning and directly affects the quality of learning processes and outcomes (Sagala, 2017). Pedagogical competence in practice covers teachers' ability to understand students' needs, select and apply appropriate learning models and strategies, manage classrooms, integrate information technology, develop curriculum, and conduct comprehensive assessment. Strengthening this competence is especially crucial at the primary school level, which forms the initial foundation of students' academic abilities and character (Sanusi et al., 2021).

The rapid development of digital technology has significantly shifted the demands on teachers' pedagogical competence. Teachers are now expected not only to master subject matter but also to integrate Information Technology (IT) effectively in learning. Twenty-first century learning, which is closely linked to technology, requires teachers to be responsive to advances in science and technology and to possess adequate digital skills (Rahayuningsih, 2022). The use of IT, such as educational software, digital platforms, and internet-based resources, is expected to improve the quality of learning and reduce gaps in teachers' technological competence. IT-based learning systems also facilitate more effective and efficient planning, implementation, assessment, and reporting (Wafaul, 2021).

Empirical data, however, show that the integration of IT in learning still faces major challenges. The 2022 Teacher Competency Test (UKG) in Bengkalis Regency recorded an average pedagogical competence score of only 56.74%, far below the ideal standard and lower than the average score in West Sumatra Province (69.12%) (Kemendikbudristek, 2022). Because pedagogical competence as measured in UKG includes the ability to integrate IT into learning, these low scores indicate that many teachers have not yet optimally used technology in their teaching.

A preliminary survey of 18 primary school teachers in Bukit Batu Subdistrict found that 72.2% of teachers experienced difficulties in using technological devices for learning. Limited digital skills, lack of training, and inadequate infrastructure were identified as the main causes. This situation highlights a clear gap between the demands for technology-based pedagogical competence and the realities faced by

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teachers in the field. Teacher competence itself is shaped by various factors such as educational background, training and professional development, teaching experience, school facilities, and supportive school culture (Djamarah, 2015).

School leadership, particularly the role of the principal, is another crucial determinant. Research shows that principals with strong leadership can significantly improve teacher competence (Syukrillah, 2020). Juwita et al., (2023) emphasize that principals occupy a strategic position in promoting teachers' pedagogical competence through structured training, mentoring, and ongoing supervision. Principals are expected to act not only as administrators, but also as change agents who build innovative learning ecosystems that are adaptive to technological development. This aligns with transformational leadership theory (Bass & Avolio, 1994), which stresses the importance of leaders in providing motivation, inspiration, and support to enhance organizational performance, including that of teachers.

In Bukit Batu Subdistrict, variations in leadership style, differing levels of support for teachers' professional development, and limited school facilities make the area a relevant site for examining how principals contribute to improving teachers' competence in using IT in learning. Research by Andika (2023) indicates that principals who actively guide and motivate teachers can improve teachers' skills in operating and integrating learning technologies. A 2025 survey in several public primary schools in Bukit Batu found that many teachers still struggle to integrate technology in the classroom due to limited training opportunities and inadequate facilities. Principals themselves report infrastructure constraints as a major obstacle to developing teachers' IT competence. Teachers, on the other hand, expect principals to be more proactive in creating supportive school cultures, providing adequate facilities, and offering relevant training and motivation.

At the policy level, the government has introduced regulations to strengthen IT-based teacher competence, including Minister of Education, Culture, Research, and Technology Regulation No. 19 of 2024 on Teacher Professional Education and Regulation No. 47 of 2023 on technology-based competence development. However, implementation at the school level still requires significant reinforcement. The role of principals in encouraging the enhancement of IT-based pedagogical competence has not yet been fully optimized. Many teachers continue to face constraints related to skills, infrastructure, and access to contextual training, while motivational efforts by principals have not been sufficiently effective in changing pedagogical practices across planning, implementation, and evaluation.

In this situation, the principal's role becomes pivotal as a driver of change in the school environment. Through providing and managing digital facilities, mentoring teachers in the use of technology, and fostering a school culture open to innovation, principals can substantially enhance teachers' confidence and digital skills. When principals are able to identify teachers' needs and design relevant professional development programs, the transformation toward IT-based learning can proceed more effectively and sustainably.

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Based on the above description, strengthening IT-based pedagogical competence among teachers is an urgent need in responding to educational challenges in the digital era. Its success does not depend solely on national policy, but is also strongly influenced by leadership at the school level. Therefore, this study aims to examine in depth the role of principals in motivating teachers to improve IT-based pedagogical competence in public primary schools in Bukit Batu Subdistrict, with the broader goal of contributing to the development of a more adaptive and high-quality education system aligned with technological progress.

## **2. Methodology**

This study employs a qualitative research design with a phenomenological approach to gain an in-depth understanding of the lived experiences of school principals and teachers in relation to motivation and the strengthening of pedagogical competence through information technology. This approach was chosen because the research seeks to explore how participants perceive, interpret, and experience leadership practices and motivational processes within their natural school contexts. Qualitative research emphasizes understanding meaning from the perspectives of individuals who directly experience a phenomenon (Creswell, 2015), while phenomenology specifically aims to uncover the essence of experiences as consciously lived by participants. Through this approach, the researcher interprets how principals make sense of their role as motivators and how teachers experience efforts to enhance pedagogical competence mediated by motivation and technology integration.

The research adopts a descriptive qualitative design to systematically and factually portray behaviors, processes, and interaction dynamics between principals and teachers without manipulating variables. This design enables the researcher to capture authentic leadership practices and professional development processes as they naturally occur in schools, thereby producing a comprehensive and contextualized depiction of leadership roles and teacher pedagogical development through the use of information technology.

The study was conducted in two public elementary schools in Bukit Batu Subdistrict, namely SD Negeri 005 and SD Negeri 009, which were selected through purposive sampling. Both schools have implemented information technology in learning activities and actively participate in programs aimed at developing teachers' digital and pedagogical competencies. SD Negeri 005 is characterized by relatively adequate technological facilities, while SD Negeri 009 faces limitations in terms of devices and internet access. These differing school conditions provided a meaningful basis for phenomenological comparison in understanding how principals motivate teachers to improve pedagogical competence under varying levels of technological support. The research was carried out from May to September 2025, covering the stages of data collection, analysis, and report writing.

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Data in this study were obtained from human sources and supporting documents relevant to the research focus. Informants were selected purposively based on their roles and involvement in leadership and instructional processes. The school principal served as the key informant due to their central role in policy-making, leadership, and motivation. Supporting informants included four teachers, one vice principal, and one administrative staff member who had access to institutional documents related to teacher development and technology integration. In total, eight informants provided comprehensive perspectives on leadership practices, motivation strategies, and pedagogical competence development.

Data collection was conducted through in-depth interviews, participatory observation, and documentation study. The idea of using interviews was grounded in the need to explore participants' subjective experiences and personal interpretations of motivation, leadership, and pedagogical competence. Semi-structured interview guidelines were developed based on theories of educational leadership, teacher motivation, and pedagogical competence, allowing flexibility for participants to describe their experiences in detail. Interviews with principals focused on leadership strategies, motivational approaches, and decision-making related to technology integration, while interviews with teachers explored their experiences of receiving motivation, challenges in using technology, and perceived changes in pedagogical competence.

Observations were conducted to complement interview data by capturing real-time behaviors and interactions within the school setting. The researcher observed teaching and learning activities, staff meetings, academic supervision sessions, and informal interactions between principals and teachers, with particular attention to how principals motivated teachers, how teachers implemented technology in classroom instruction, and how leadership support was manifested in daily practices. These observations provided contextual evidence of leadership dynamics and technology-based pedagogical practices. Documentation study was carried out to strengthen and verify data obtained from interviews and observations. Documents analyzed included teacher training reports, academic supervision records, school programs related to technology integration, lesson plans, and other relevant institutional documents. These materials helped illustrate formal efforts to improve pedagogical competence and provided concrete evidence of leadership initiatives and professional development activities.

To ensure data validity, the study applied credibility techniques such as source triangulation, method triangulation, member checking, and peer discussion. Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2020), consisting of data condensation, data display, and conclusion drawing and verification. Through this analytical process, patterns and meanings related to the principal's role in motivating teachers and strengthening pedagogical competence through information technology were systematically identified and interpreted.

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### 3. Results and Discussion

Before presenting the substantive findings, it is important to explain how the research process and data collection were conducted to provide context for the interpretation of the results. This study was carried out through a qualitative phenomenological approach, emphasizing direct engagement with participants in their natural school environments. Data collection began with preliminary observations and informal discussions to understand the school context, leadership structure, and existing practices related to information technology integration. These initial activities helped the researcher build rapport with participants and refine the focus of the interview questions so that they aligned with actual conditions in the field. The research process was conducted gradually and reflectively to ensure that participants' experiences were captured authentically and comprehensively.

The interview process constituted the primary source of data in this study. Semi-structured interviews were conducted with principals as key informants and with teachers, vice principals, and administrative staff as supporting informants. Interviews were designed to explore participants' experiences, perceptions, and interpretations of the principal's role in motivating teachers and strengthening ICT-based pedagogical competence. Each interview was conducted face-to-face in a quiet and comfortable setting within the school environment and lasted between 45 and 60 minutes. The flexible interview format allowed the researcher to probe deeper into emerging issues while still maintaining consistency across participants. All interviews were recorded with participants' consent and subsequently transcribed verbatim to ensure accuracy and reliability in the data analysis process.

The interview questions were developed to guide data collection in a systematic yet flexible manner, in accordance with the phenomenological approach adopted in this study. The questions were designed to explore participants' understanding, experiences, and perceptions regarding the principal's role, motivational practices, and the integration of information technology in strengthening teachers' pedagogical competence. While the core questions remained consistent across informants to ensure comparability, probing questions were adjusted during interviews to capture deeper meanings and context-specific experiences. Table 1 presents the main interview questions used as a reference during the interview process.

Table 1. Interview Questions Used in the Study

No.	Interview Question
1	How do you understand ICT-based pedagogical competence in the context of teaching and learning at this school?
2	What policies or programs has the principal implemented to encourage the use of information technology in learning?
3	How does the principal motivate teachers to improve their pedagogical competence through the use of ICT?
4	What types of training or professional development related to ICT have you participated in?

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No.	Interview Question
5	What challenges do teachers face when integrating information technology into classroom learning?
6	How do school facilities and infrastructure support or hinder the use of ICT in teaching?
7	How is academic supervision conducted to monitor the use of ICT in learning activities?
8	In your experience, how has the use of ICT influenced teaching practices and student engagement?
9	What forms of support do teachers receive from school leaders when facing difficulties in using ICT?
10	What improvements are needed to optimize the principal's role in strengthening teachers' ICT-based pedagogical competence?

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### ***Research Findings***

#### ***The Principal's Role in Improving Teachers' ICT-Based Pedagogical Competence***

##### ***SD Negeri 005 Bukit Batu***

This study identified several challenges and strategies implemented at SD Negeri 005 Bukit Batu related to the use of information technology (IT) in learning. Understanding of ICT-based pedagogical competence is already present among the principal, vice principal, and teachers. Nevertheless, the limited availability of devices and adequate internet connectivity remains a major obstacle to optimizing the use of IT. In addition, uneven IT training has also become a constraint, so not all teachers are able to utilize IT optimally in the learning process. To improve teachers' competence in the use of IT, the school has implemented several strategies, such as regular training, workshops, peer mentoring, and the provision of ICT-based learning modules. However, differences in teachers' levels of readiness and motivation as well as limited devices remain major challenges to optimal IT integration.

Although a policy requiring the use of IT in learning has been implemented, the varying readiness of teachers, the lack of time for training, and the limitations of devices and internet networks are still the main barriers. Therefore, it is necessary to strengthen continuous training and provide more adequate facilities so that this policy can be implemented effectively. The school has provided basic facilities such as laptops and internet access, but the lack of more advanced devices and unstable internet connectivity has hindered the optimal use of IT. The monthly training provided is also limited in time, and some teachers find it difficult to participate in more in-depth training. To support more optimal IT use, the school needs to strengthen training, provide more adequate facilities, and improve access to stable internet. Academic supervision carried out to monitor the use of IT is also limited by time, so teachers feel that they need more time for reflection and deeper discussions regarding IT implementation. Evaluation of the success of IT use in learning is carried out through IT-based assessments and student feedback. However, difficulties emerge in measuring the impact of IT on student learning outcomes, and there is no uniform evaluation standard regarding IT use in the

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school. Therefore, strengthening training, providing more adequate facilities, and improving evaluation are needed to maximize the use of IT in learning at SD Negeri 005 Bukit Batu.

### ***SD Negeri 009 Bukit Batu***

This study discusses various challenges and efforts in integrating information technology (IT) in learning at SD Negeri 005 Bukit Batu. Understanding of ICT-based pedagogical competence has been well accepted by the principal, vice principal, and teachers, but the main challenges faced are the imbalance of facilities and difficulties in aligning technology with students' needs. In addition, limited devices and unstable internet connections also hinder the optimization of IT in learning. Even so, the school has implemented various strategies to improve teachers' competence, such as regular training, workshops, and peer mentoring. However, differences in teachers' readiness and motivation, as well as limited devices, remain obstacles to the maximum implementation of IT. The school has also implemented a policy of IT use in every learning activity, but the main challenges are the lack of time for training and teachers' difficulties in adapting to technology.

The school provides basic facilities such as laptops and internet, but additional support in the form of further training and technical guidance is highly needed. Although academic supervision of IT use has been carried out, limited time for more in-depth evaluation reduces the effectiveness of this supervision. Evaluation of the success of IT integration is conducted through assessment of learning outcomes and observation, but difficulties in determining appropriate indicators and the lack of student feedback become major obstacles in assessing the success of IT use. Overall, although there are supporting policies and facilities, the greatest challenges are disparities in facilities, teachers' readiness and motivation, and limited time for training and evaluation, all of which affect the effective integration of IT in learning.

### ***Supporting and Inhibiting Factors in the Principal's Role in the Utilization of IT***

#### ***SD Negeri 005 Bukit Batu***

Information technology (IT) facilities and infrastructure in the school are generally adequate to support technology-based learning, but there are still some classrooms that are not equipped with sufficient devices, such as computers and projectors. This uneven distribution of facilities hampers the optimal use of IT, which in turn affects the quality of learning in classrooms that lack those devices. Even so, the school receives support from the Education Office in the form of IT devices and training for teachers. However, the limited number of devices and unequal access to training programs prevent IT use from being maximized throughout the school, creating imbalances in its implementation. With regard to teachers' competence levels, the majority of teachers in the school are quite competent in using IT, but the lack of motivation and hesitation among some teachers becomes an obstacle to integrating IT optimally in the learning process. Some teachers still tend to use traditional

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methods even though IT devices are available. Other constraints include limited devices and unstable internet access, as well as differences in teachers' ability levels in utilizing technology. Although IT facilities have been provided, these problems hinder the optimal implementation of IT in learning and require further attention to overcome these barriers so that technology can be used effectively.

### ***SD Negeri 009 Bukit Batu***

Most classrooms at SD Negeri 005 Bukit Batu are already equipped with adequate information technology (IT) devices such as computers and projectors, but some classrooms still lack these devices, which hinders the optimal use of IT in learning. Some existing devices are also becoming outdated and need to be upgraded in order to be used optimally. Although the school receives support from the Education Office in the form of IT devices and training for teachers, the limited number of devices and the lack of evenly distributed training remain major challenges in optimizing IT utilization. Many teachers are quite competent in using IT, but varying levels of motivation and a lack of self-confidence among some teachers still hinder the maximum integration of IT in learning, with some teachers still preferring traditional teaching methods. In addition, other constraints include limited budgets for device renewal and unstable internet connections in several areas of the school, which affect the effectiveness of IT use. The lack of advanced training for teachers and the inability of some teachers to fully utilize technology also become inhibiting factors. Therefore, to optimize the use of IT in learning, more equitable updating of devices, increased training, and more intensive technical support are needed.

### ***Patterns of the Principal's Effective Role in Improving Teachers' Pedagogical Competence through IT***

#### ***SD Negeri 005 Bukit Batu***

This study reveals the importance of participatory leadership and collaborative strategies in developing teachers' competence based on information technology (IT). The principal applies a participatory leadership model by involving teachers in IT development, although there are still difficulties in achieving a uniform understanding of IT use in the classroom. To improve teachers' abilities, the school implements regular training, peer mentoring, and hands-on, practical training, although limited time becomes the main constraint in implementing more in-depth training. Teachers' involvement in planning and implementing IT-based activities is also important to ensure effective IT application in the classroom, but gaps in understanding among teachers remain a challenge. Although a digital culture has begun to form in the school, many teachers have not fully adapted to technology, so stronger support and continuous training are needed. Collaboration among teachers is also a key factor in maximizing the use of IT, yet limited time for discussion and coordination hampers more effective collaboration. Overall, although various efforts have been made, the main challenges faced are time constraints, inadequate facilities, and gaps in understanding among teachers, which require increased support and further training.

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### ***SD Negeri 009 Bukit Batu***

In managing the development of ICT-based teacher competence, the principal applies a transformational leadership model that encourages teachers to innovate and integrate technology into learning. Although teachers feel motivated, the main challenges are the lack of ongoing support and in-depth training. Strategies used to improve teachers' competence include practice-based training and peer mentoring, which have proven effective, although limited time remains a constraint. Teachers' involvement in planning and implementing IT-based activities is carried out through discussions and workshops, but differences in understanding of more technical IT materials remain a challenge. To strengthen the digital culture, the principal encourages consistent use of IT, although stronger encouragement is still needed so that all teachers actively engage in ICT-based learning. Collaboration among teachers in small groups has proven effective in increasing their understanding of IT, but it needs to be expanded to maximize the use of technology in the classroom. Overall, although there has been progress in IT use, the main challenges remain limited time, lack of technical support, and limited facilities, all of which affect the optimal integration of IT in learning.

### ***Discussion and Findings***

#### ***The Principal's Role in Improving ICT-Based Pedagogical Competence***

At SD Negeri 005 Bukit Batu, the principal plays a significant role in enhancing teachers' ICT-based pedagogical competence, although challenges such as limited devices and unstable internet access persist. The findings indicate that awareness of the importance of ICT in learning is already well developed among school leaders and teachers. However, variations in teachers' readiness, confidence, and motivation limit the optimal integration of technology in classroom practices. Regular training programs and peer mentoring initiatives have contributed positively to teachers' competence development, yet the effectiveness of these efforts is constrained by limited training duration, insufficient facilities, and the absence of standardized evaluation criteria for ICT-based instruction. The principal's leadership practices reflect elements of transformational and participatory leadership, particularly through encouraging innovation, collaboration, and teacher involvement in ICT adoption. Transformational leadership emphasizes inspiring teachers to embrace change and develop professionally, while participatory leadership highlights shared decision-making and collective responsibility (Bass & Avolio, 2018; Bush, 2011). Despite these efforts, teachers who lack confidence or are accustomed to traditional teaching methods encounter difficulties in integrating ICT effectively. In addition, limited devices and unstable internet connectivity continue to restrict classroom implementation, even when policies supporting ICT use are in place. These findings suggest that leadership support alone is insufficient without continuous capacity building, adequate infrastructure, and systematic evaluation mechanisms. Strengthening professional development programs, expanding access to ICT facilities, and allocating sufficient time for experimentation and reflection are essential to ensure meaningful ICT integration. This conclusion is consistent with

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previous studies indicating that sustained training and institutional support are critical factors in improving teachers' digital and pedagogical competence (Tondeur et al., 2017; Scherer et al., 2019).

### ***Supporting and Inhibiting Factors in the Principal's Role in ICT Utilization***

At SD Negeri 005 Bukit Batu, ICT implementation has begun but continues to face substantial challenges, including uneven distribution of devices across classrooms and unstable internet connectivity. Differences in teachers' technological skills and confidence further inhibit the effective use of ICT, despite the availability of regular training and peer mentoring. External support from the local Education Office, such as the provision of devices and training opportunities, has contributed positively, yet remains insufficient and unevenly distributed.

According to Shulman (1987) theory of teacher professionalism, effective teaching requires not only content knowledge but also pedagogical knowledge and the ability to integrate appropriate instructional tools, including technology. In the context of ICT integration, teachers must develop technological pedagogical competence to align digital tools with instructional goals. Similar conditions were identified at SD Negeri 009 Bukit Batu, where limited facilities, unstable internet access, and variations in teacher motivation hinder optimal ICT use. Technology Readiness Theory explains that both internal factors, such as attitudes and self-efficacy, and external factors, such as infrastructure and technical support, influence individuals' readiness to adopt technology (Teo, 2013).

The findings indicate that the principal's role in creating a supportive environment is crucial, yet must be reinforced by adequate facilities, advanced training, and ongoing technical assistance. Previous studies have consistently shown that while leadership support and training can enhance ICT-based pedagogical competence, inadequate infrastructure and uneven teacher capacity remain significant barriers to effective technology integration in schools (Ertmer & Ottenbreit-Leftwich, 2010; Fraillon et al., 2019).

### ***Effective Leadership Patterns in Enhancing ICT-Based Pedagogical Competence***

At SD Negeri 005 Bukit Batu, the principal applies a participatory leadership approach by involving teachers in planning and implementing ICT-based learning activities. This approach encourages collaboration and shared responsibility, although achieving a uniform understanding of ICT integration remains challenging, particularly among teachers with limited technological experience. Training and peer mentoring have proven beneficial, yet limited time and varying levels of adaptation hinder the development of a fully embedded digital culture within the school. At SD Negeri 009 Bukit Batu, the principal demonstrates transformational leadership by motivating teachers to innovate and integrate ICT into learning. Practice-based training and peer mentoring are perceived as effective strategies; however, teachers express the need for more frequent, in-depth, and continuous professional development. Limited technical support and differences in

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teacher motivation further constrain progress. Teachers' involvement in ICT-based curriculum planning and collaborative activities contributes positively to competence development, but stronger leadership encouragement is required to ensure consistent ICT use across all classrooms. These findings align with participatory and transformational leadership theories, which emphasize empowerment, collaboration, and continuous professional growth as key factors in educational improvement (Bass & Avolio, 2018; Leithwood & Jantzi, 2005). Empirical studies have also demonstrated that transformational leadership and access to digital resources positively influence teachers' digital competence and pedagogical practices (Tondeur et al., 2017; Scherer et al., 2019). Overall, the principal's influence is substantial in supporting ICT integration, yet optimal implementation depends on equitable training, adequate facilities, continuous technical support, and systematic evaluation mechanisms. Strengthening these aspects is essential to ensure sustainable and effective ICT-based learning practices.

#### **4. Conclusion**

This study shows that principals play a crucial role in improving teachers' pedagogical competence through the use of information technology (IT), despite the various challenges that hinder the optimization of IT implementation. The main obstacles include limited IT devices, unstable internet access, and varying levels of teacher readiness in adopting and using technology effectively. Principals have made efforts such as conducting training and facilitating peer mentoring, yet the lack of technical support, limited time, and unequal facilities among schools remain significant barriers. Therefore, there is a need for improved supporting facilities, more intensive and continuous training, and clear evaluation measures to assess the success of IT implementation. At SD Negeri 005, the principal employs a participatory leadership model by providing opportunities for teachers to contribute to ICT development, although difficulties in understanding technology and time constraints continue to hinder progress. Meanwhile, at SD Negeri 009, the principal practices transformational leadership by motivating teachers to innovate with ICT, but insufficient technical support and varying teacher motivation remain major obstacles in maximizing ICT use. Overall, despite training efforts and support from the Education Office, challenges such as limited devices, unstable internet access, and teacher readiness continue to impede the optimal use of ICT. Therefore, improved facilities, more intensive training, and stronger technical support are needed to ensure that ICT can be utilized to its fullest potential in the learning process.

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