

## Analysis of Principals' Managerial Transformational Leadership: Teachers' Digital Literacy in Elementary Schools

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### ABSTRACT

Educational change requires teachers to be more digitally literate due to rapid technology development. This adjustment is difficult for some teachers, especially elementary school teachers. This research is driven by the principal's transformative leadership and managerial talents in guiding this transition. The purpose of this study is to analyze the principal's managerial strategy, how the principal improves teachers' digital literacy, teachers' perceptions of the principal's transformational leadership style, and the obstacles faced by teachers in improving digital literacy. This study uses a qualitative approach with a case study method. The research subjects consisted of the principal, teachers at various levels, and administrative staff. Data sources were obtained through in-depth interviews, field observations, and documentation. The research instruments were interview guidelines and observation sheets. The data analysis technique used was the interactive model of Miles, who plays, which consists of data reduction, data presentation, and drawing conclusions. Data validity was maintained through triangulation techniques for data sources and methods. The findings of this study demonstrate that the principal has adopted a transformational leadership style by offering motivation, serving as a role model, and fostering collaboration among teachers. However, some teachers have encountered resistance due to age, time constraints, and a lack of confidence in using digital devices. School principals continue to make various efforts to overcome these obstacles so that teachers' digital literacy can improve sustainably.

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## 1. INTRODUCTION

Elementary school education is the primary foundation for developing students' character and competencies (Ratnaningsih, 2016; Surtini & Muhtar, 2024). In the era of Industrial Revolution 4.0 and Society 5.0, the educational process faces massive demands to adapt to digital technology (Tavares et al., 2022; Legi et al., 2023). The need for digital literacy is no longer merely an additional skill but an essential competency

for every individual, especially teachers (Sánchez-Cruzado et al., 2021; Kasperski et al., 2022).

Elementary school teachers, as agents of change on the front lines, are required to integrate technology into the curriculum and learning process (Digón-Regueiro et al., 2023). However, the reality on the ground often shows a significant gap in digital literacy skills among educators, influenced by factors such as age, training, and infrastructure availability (Reddy et al., 2023; Timotheou et al., 2023; Ndibalema, 2025). This gap directly hinders the effective implementation of modern curricula, such as the Independent Curriculum, which heavily emphasizes the use of digital platforms.

A person's leadership skills are natural. The ability to manage organizational resources to achieve predetermined goals is managerial competence (Tanjung et al., 2022; Rony et al., 2023). To lead and manage an organization, one must possess managerial competence—observed, measured, and developed knowledge, abilities, attitudes, and behaviors (Ridwan, 2021; Nabila et al., 2022). An effective and efficient principal can help improve school quality. The principal has a large responsibility to improve school quality and must be able to manage all resources to make learning effective and efficient (Huda, 2018; Riani & Ain, 2022; Hamka, 2023).

The success of schools in responding to the challenges of digitalization depends heavily on the quality of leadership at the managerial level (Navaridas-Nalda et al., 2020; Karakose et al., 2021; Chatzipanagiotou & Katsarou, 2023; Ruloff & Petko, 2025). Principals are the architects and driving forces of change in schools. In a context of rapid and ambiguous change, the most relevant leadership style is transformational leadership (Müller et al., 2020; Karakose et al., 2023; Yakob et al., 2025).

Transformational leadership (TL) is the ability of a leader to inspire, motivate, and intellectually stimulate followers to do better than expected and put the goals of the organization ahead of their own (Anderson, 2017; Khan et al., 2022; Bakker et al., 2023; Ghorbani et al., 2023). In the digital context, transformational principals play a crucial role in creating the school's digital vision, fostering teachers' intrinsic motivation to learn new technologies (Laschou et al., 2018; Thomas et al., 2020), providing intellectual stimulation to encourage teachers to innovate with digital media, and providing individual attention and technical support tailored to each teacher's specific needs.

Although numerous studies have examined the relationship between transformational leadership and teacher performance in general, there is limited research that specifically and in-depth examines the managerial mechanisms used by principals to raise the digital literacy of elementary school teachers, who face unique characteristics and challenges compared to other levels of education.

Previous research has tended to focus on general correlative or descriptive relationships between transformational leadership and digital literacy. The novelty of this article lies in its sharper and more detailed analytical focus. It measures the extent to which principals have successfully transformed elementary school teachers' mindsets from passive users to active developers of innovative digital learning content and methods. This research will explore which specific types of intellectual stimulation (e.g.,

peer coaching, learning hackathons, or digital action research) are most effective in elementary school settings.

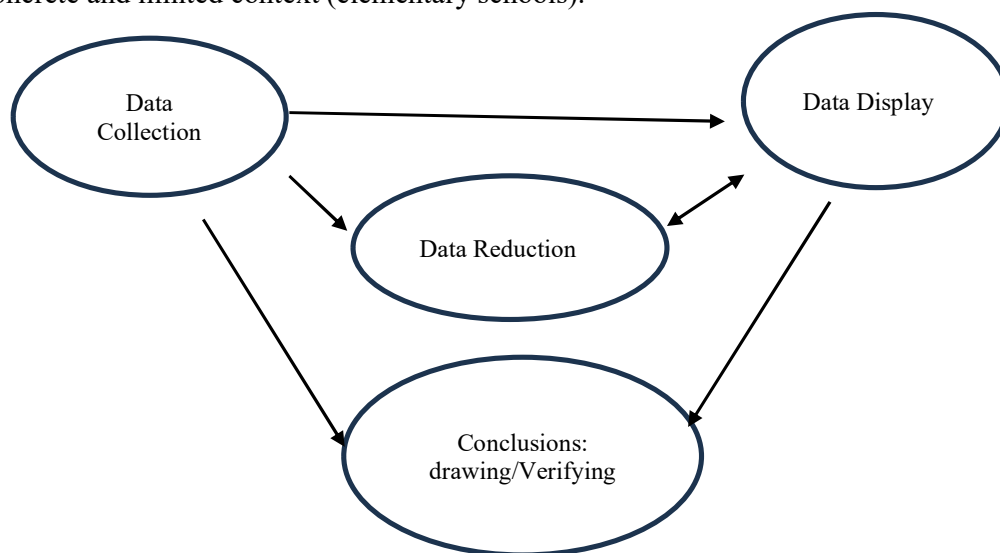
Furthermore, elementary school teachers' digital literacy is highly heterogeneous, ranging from highly skilled to technologically illiterate (Quaicoe & Pata, 2020; Dong et al., 2022). This research offers novelty by focusing on the dimension of principals' individualized consideration. This study analyzes how principals structure differentiated and segmented personal mentoring and guidance programs (e.g., dedicated mentoring groups for senior teachers versus mentoring for junior teachers), which are key to transformational success in addressing the digital divide in elementary schools.

The results of this study are not only theoretical but are also expected to produce a managerial guidance model that can be used by the Department of Education and principal leadership training institutions. This model will formulate practical and structured steps for transformational principals to systematically encourage, measure, and ensure improvements in teacher digital literacy in elementary schools.

Therefore, this article aims to fill the gap in the literature by presenting a detailed causal mechanism analysis of principals' managerial transformational leadership in transforming elementary school teachers' digital literacy skills into applicable and sustainable digital pedagogical competencies.

## 2. METHOD

This research uses a qualitative approach with a case study design. It focuses on elementary schools considered successful (instrumental cases) in implementing digital transformation under transformational leadership. The purpose of the case study design is to holistically and in-depth describe and analyze the phenomenon of principal managerial transformational leadership and its impact on teacher digital literacy in a concrete and limited context (elementary schools).



**Figure 1. Qualitative data analysis**

Research subjects will be selected using purposive sampling techniques to obtain rich data from multiple perspectives. Principals (Key Informants): Act as transformational and managerial agents. Core Teachers: Consisting of teachers with varying levels of digital literacy (high, medium, or low) or teachers actively and passively involved in digital programs. Vice Principals/Curriculum Coordinators: Act as implementers of the principal's managerial policies. Education Personnel/IT Staff (if any): Provide information regarding managerial infrastructure support.

Data were collected through triangulation of sources and methods to increase the credibility and validity of the findings. The primary instrument in this qualitative research was the researcher herself (human instrument). Researchers were assisted by: Interview Guidelines: Contains a list of key questions compiled based on the transformational leadership dimensions (Bass & Avolio) linked to the teacher digital literacy indicators. Observation Guidelines: Contains checklists and structured field notes to record relevant managerial and pedagogical interactions and activities. Document Analysis Sheets: Used to record and categorize important information from official documents.

Data analysis was conducted continuously from initial data collection to completion, following a qualitative analysis model adapted from Miles, Huberman, and Saldaña: Data Collection: The process of collecting data through interviews, observations, and documents. Data Reduction: Summarizing, selecting key points, focusing on key themes (e.g., Principal Intellectual Stimulation, Senior Teacher Challenges, Learning Innovation), and discarding irrelevant data. Data Display: Presenting the reduced data in narrative form, tables, matrices, or flowcharts to facilitate understanding and conclusion drawing. Conclusion Drawing/Verification: Drawing tentative conclusions that are verified with field data. This process involves searching for patterns, themes, and causal relationships between the Principal's Transformational Leadership and teachers' increased digital literacy.

To ensure the validity and reliability of the findings, several techniques were used, namely Source Triangulation: Comparing information obtained from the principal, teachers, and vice principal regarding the same managerial strategy. Method Triangulation: Comparing interview data with observation results and document content. Credibility Test (Member Check): Confirming the results of data interpretation and conclusions with research participants to ensure that the findings presented are in accordance with their views. Prolonged Engagement: Conducting observations and interviews over a long period of time to build trust and obtain in-depth data.

### **3. RESULTS AND DISCUSSION**

#### **Results**

Researchers, informed by their observations of research findings, found many concerns, notably that some educators had not yet attained the expected outcomes in comprehending and enhancing the utilization of digital media for classroom instruction.

Interviews with four informants indicated that age, insufficient training, and time constraints hindered teachers' comprehension and application of available digital tools, despite the presence of adequate school resources such as projectors, laptops, interactive flat panel TVs, and speakers for classroom instruction. This study investigated how transformational leadership by the principal could mitigate issues encountered in schools.

Leadership is an essential component of management; thus, proficient leadership abilities are vital for being an effective manager. Followership constitutes the core of leadership, wherein individuals or subordinates willingly adhere to the leader's directives. Principal leadership is crucial in enhancing the performance of teachers and personnel within the school environment. Leadership profoundly influences the structure of a school. The principal's leadership approach is a crucial factor in the operational performance and educational quality of the school, acting as a fundamental guide in decision-making and program development. A leadership strategy employed is transformational leadership, when the principal endeavors to foster constructive change and innovation by inspiring staff and students to realize their potential.. Leadership strategies:

*“To improve the quality of this school, the first thing we do is conduct an evaluation based on a SWOT analysis to find out what the strengths, threats, and challenges are around the school. After that, I and the teachers held a work meeting, then formed a work team and we socialized all the things discussed together to parents, especially in the new school year, to invite them to participate in improving the quality of the school.”*

A school is an educational institution comprising different interconnected dimensions that mutually support one another, facilitating teaching and learning to enhance the quality and potential of pupils. The principal serves as the planner, compiler, director, and organizer of any program and must establish a clear purpose to ensure alignment with collaboratively developed objectives. The principal has delineated responsibilities and powers with collaboratively established objectives and targets. The principal successfully attains the objectives of the school's vision and mission due to their leadership, which is a crucial element in the school's ecosystem and encompasses oversight of all aspects of the institution they govern. The principal articulated the vision and mission:

*"The school's previous vision and mission were based on an analysis of the needs of students, parents, and stakeholders. Observing existing phenomena and then developing an overall vision for the future served as the foundation for me and my team in formulating the vision and mission."*

A compelling and motivating vision produced by transformational leadership can offer explicit guidance for educators in attaining their defined objectives. Moreover, leadership support can enhance teachers' sense of value and acknowledgment for their contributions to elevating educational quality and the institution as a whole. A principal's transformational leadership approach prioritizes optimal strategies for fostering intellectual stimulation and exhibits genuine concern for each member of the

organization. The principal must address these factors to enhance the effectiveness of educators and staff, as well as the quality of the school:

*"In carrying out all my duties, I always empower teachers through cooperative collaboration, discussion, providing opportunities for teachers who want to improve their profession, and encouraging and involving all members in various activities that support the school program."*

The principal has the right strategy for maintaining harmonious relationships with the environment, implementing new ideas, seeking ideas, integrating all activities, setting an example for all educational staff in the school, and developing innovative learning models. The principal's role as an innovator is reflected in the way he or she carries out his or her work—creatively, constructively, integratively, delegatively, rationally and objectively, with discipline, exemplary behavior, and adaptability and flexibility. The success of a program can be achieved optimally if implemented diligently, with ongoing supervision, mentoring, and evaluation:

*"To stimulate them in fostering teacher creativity, I usually first motivate them to express ideas or provide them with feedback. For example, if I find some innovations in learning, I share them with them and then use them as references for them to modify and imitate. I then facilitate these modifications with training and coaching through workshops outside of the classroom. These activities certainly don't just foster creativity, but can also increase self-confidence."*

*"And regarding teacher motivation and self-confidence, I usually provide constructive feedback. In terms of teaching and learning activities, after observations, I provide constructive feedback on how to improve them in the future. I then give these teachers rewards, which certainly aren't always prizes, but rather positive support."*

Principals can also discern instructors' strengths and flaws in the execution of learning. The solution involves advanced coaching to enable teachers to rectify current weaknesses and sustain their teaching excellence through supervision. Supervision is the principal's duty to assess the degree to which instructors can execute learning. This task is accomplished by classroom observations to directly assess the learning process, method selection, media utilization, and student involvement. Consequently, principals can discern instructors' strengths and weaknesses in the implementation of learning, particularly regarding technology.

The cognitive engagement of principals fosters an environment in which teachers may engage in critical, creative, and innovative thinking to tackle educational difficulties. Principal leadership is essential in fostering a collaborative culture that enhances teacher learning and professional growth. Individual consideration is a component of transformational leadership that contributes to enhancing teacher effectiveness. Principals that engage in individual consideration focus intently on the needs and potential of each educator. Principals facilitate professional development by mentorship, training, and constructive criticism. Educators who see individual care experience enhanced value and increased self-assurance. Technology is an accessible

instrument for all in the age of globalization and advancements in information technology. Educational institutions must engage in and apply creative and new pedagogical approaches. Technological transformation has rapidly evolved with the changing times, and in the educational process, technological media plays a crucial role in facilitating effective learning from professors to students. Digital literacy encompasses numerous essential components, specifically the educator's capacity to critically assess all online sources, the proficient use of digital tools, and the educator's creative aptitude for employing technology to develop engaging learning materials. By providing learning materials in a more interactive manner, educators can enhance the student's educational experience and foster collaboration among students:

*"As time goes by, it is really necessary, whether we like it or not, teachers have to face it, one way is by being technologically literate, from there everything will be easier."*

Digital literacy has become an essential skill for educators today. Researchers found that the obstacles encountered at this school were teachers' underutilization of existing digital facilities and infrastructure. In addition to the age factor, the teachers' limited digital knowledge was inadequate to support the learning process in this digital era. The principal stated in an interview:

*"Of course, there are limited resources... meaning limited knowledge, and also resistance... Secondly, the teachers' skills... because here, the age range is diverse, so there are also differences in teacher skills in using digital platforms. Another obstacle is limited time and space, which is crucial."*

In addition to limited skills, resistance is also influenced by a lack of time to learn technology independently. This results in less than optimal integration of technology into learning. The principal recognizes this obstacle, but not all teachers have demonstrated a strong willingness to change despite the availability of digital facilities at the school. The perceived impact of digital literacy certainly requires a desire and interest in learning it:

*"The problem with our age is that sometimes we've been taught something today, and we've done it, but two days or a week later, we've forgotten what we've learned. There are also some teachers who lack interest in adapting to digital technology, even though they aren't considered seniors."*

This is one of the duties and responsibilities of teachers in schools. Besides age, some teachers have shown resistance to the use of technology in learning activities. Interviews with the principal and several teachers revealed that they felt insecure using digital devices due to unfamiliarity and fear of making mistakes. Lack of understanding of the features of digital payment applications was also a major reason for their reluctance to actively use them. Some senior teachers even stated that they felt more comfortable using conventional typing methods because they felt safer and required less adaptation:

*"The difference in digital application skills before and after learning is very significant... the condition before the application is perhaps the percentage of success in learning, interaction with students which was previously a small*

*percentage has increased sharply, ranging from 50% to 80% because digital literacy itself is very helpful in the learning process."*

Furthermore, utilizing digital media with a strong literacy knowledge will design more engaging, dynamic, and meaningful learning activities for students, thus having a positive impact and achieving learning objectives:

*"Obstacles... Usually due to age, because they feel technology is complicated, resulting in a lack of interest. Some teachers lack interest because of this. That's why I've seen principals always provide regular training for teachers they feel are lacking, but there's no harm in teachers who can participate because they have certificates. The principal usually sends the training via WhatsApp group."*

Digital literacy in primary schools aims to enhance instructor quality by developing abilities in the effective use of digital media, knowledge acquisition, academic task completion, and communication. This process imposes a challenge for certain educators due to the complexities of engaging in training or investigating new technologies.

Acquiring digital literacy equips pupils to navigate the swiftly changing information technology environment. Supporting teachers' initiatives in educational development is a potent technique for ensuring its prosperity and sustainability in the Industry 4.0 age. A potential answer to this issue is the collection of information through the capacity to handle and comprehend data pertinent to digitalization.

## Discussion

The findings of this study indicated that the school's principal determines educational quality by exercising his leadership obligations. The principal's key roles as an educational leader are: 1. School planning involves creating a vision, mission, goals, and methods for success. 2. The principal organizes the school, hires staff, and assigns assignments. 3. Intimidating means inspiring and leading. 4. Supervisors guide and control students, staff, and residents. 5. Evaluating educational outcomes and procedures to support quality growth, solving challenges analytically, systematically, and creatively, and avoiding and resolving conflicts. Principal leadership affects school growth. The principal's leadership style significantly influences the achievement and effectiveness of the school.

Furthermore, dimensions of transformational leadership (such as idealized influence/charisma, inspirational motivation, intellectual stimulation, and individualized consideration) contribute significantly to improving teachers' digital literacy. The most important factor that affects digital literacy is intellectual stimulation. This means that principals' efforts to encourage teachers to think critically, experiment with new technologies, and solve digital-related problems (e.g., creating interactive learning content) prove most effective. These findings support the theory that transformational leadership is relevant in the context of change, particularly technology adoption (Malek & Almarri, 2023; Schiuma et al., 2024). Successful leaders create a shared vision of a digital school and motivate teachers to change in accordance with the principles of transformational leadership by Bass and Avolio (Ladkin & Patrick, 2022; Agazu et al., 2025). Principals must be agents of change who are able to identify

individual needs (individualized consideration) and provide appropriate support, ranging from basic training to advanced applications in thematic learning.

Education must be based on Pancasila and the 1945 Constitution of the Republic of Indonesia, entrenched in religious values and Indonesian national culture, and sensitive to changing times. Productive, effective, efficient, and accountable education requires the principal to lead outstanding educational outcomes that meet current requirements (Rostini et al., 2022; Pardosi & Utari, 2022). Society's needs for arts, culture, knowledge, and technology support this. Digital literacy is the capacity to comprehend and use information from various computer-based sources. Computer literacy includes user and technical abilities, whereas information literacy involves recognizing, managing, mapping, and optimizing digital information (Fraillon & Duckworth, 2024).

Teachers must study the digital era's learning tools to develop personal competence (Castañeda et al., 2022). Teachers must plan, teach, and assess student learning in a digitally sophisticated manner to adapt to technology and global issues. Digital literacy includes social skills, the ability to create learning, and a critical, creative, and inspiring mindset as well as technological, information, and communication equipment (Sharma & Singh, 2024). Science and technology related to education in the digital era require school principals to be aware of changing needs and demands and be able to explore, improve, empower, and be responsible for school quality (Tolwińska, 2021; Rasdiana et al., 2024).

Literacy is crucial; teachers must confront the times by learning technology to make everything easier. Everyone must recognize that digital literacy is essential for modern life. Literacy is as vital as reading, writing, math, etc. A generation raised with boundless digital technology thinks differently. Teachers can develop professional competencies in the classroom by organizing learning administration, reflecting personal values, understanding education foundations, mastering and implementing learning programs, conducting assessments, mastering various methods, and adapting to technological developments (Fernández-Batanero et al., 2022).

However, some teachers at this school have not yet mastered technology to promote learning in the digital age, which is limiting educational quality. Teachers must build skills and professionalism in digital data education (ElSayary, 2023; Stevens, 2025). Teachers are expected to use creativity and design in digital media for learning after attending local government seminars and training. Teachers receive training on digital era advancements, including using technology and information to manage learning to fulfill educational goals, preparing students for global competition. Improving teacher performance is difficult. Since not all teachers receive training or professional development, developing teacher skills and knowledge is difficult.

In the digital age, information may boost human capacities, creating two opposing sides in digital literacy. Digital literacy provides both obstacles and opportunities for information access. Indonesian society has unfettered access to all forms of information in the information transparency era. Understanding 21st-century leadership requires adapting to changing times. The need for school leaders to create human resources plans

(Mthanti & Msiza, 2023). Principal-led professional development. Principals must encourage staff cooperation.

Implications are the practical impacts or consequences of research findings. Practical Implications (School Policy): Principals need to focus capacity-building programs on intellectual stimulation. This could take the form of regular project-based workshops (e.g., creating e-modules, using a simple Learning Management System) that encourage teacher innovation, rather than simply one-way training. Managerial policies that support digital literacy are needed, such as allocating dedicated time for teachers to learn digitally (e.g., 1 hour per week) or reward mechanisms for teachers who successfully integrate technology into their learning.

Furthermore, this study adds strong empirical evidence regarding the effectiveness of transformational leadership models in the digital era at the elementary school level, emphasizing that the managerial role (organizing resources) must be imbued with transformational values (vision and inspiration).

#### 4. CONCLUSION

Research findings indicate that through digital literacy program planning, training organization, and program implementation oversight, the principal demonstrated his ability to formulate technology policy directions, assign tasks to teachers according to their competencies, and evaluate teachers' digital development within the school. This goal was achieved through providing facilities, conducting internal training, and providing encouragement and role models in technology use. This improvement was also supported by collaboration between teachers and personal mentors and the use of digital media in learning activities. Moreover, the principal established a small team to offer technical support to teachers facing challenges. This collaboration fostered a culture of mutual support and learning among teachers in their use of technology. This approach created a conducive atmosphere and built confidence to more actively utilize digital devices in learning activities.

As a suggestion, teachers viewed the principal as a transformational leader capable of providing inspiration, motivation, and support in navigating technological developments. The principal was considered playing an active role in building an innovative work culture, listening to teacher input, and providing space for experimentation with digital media. The challenges include age factors that make them less adaptable to technology, a lack of interest in learning it, time constraints due to administrative and teaching burdens, and a lack of in-depth advanced training. This results in suboptimal technology utilization, particularly in classroom learning, and a lack of consistent, ongoing support, which is still desperately needed to improve teachers' digital literacy across the board.

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