

Adaptive Leadership of Principal as The Key Pillar of Teacher's Digital Transformation in Disruption Era: A Case Study at State Senior High Schools

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Abstract: The quick rate of technology innovation in the disruption era has highlighted teachers' inadequate digital competency, posing hurdles to effective digital transformation in education. This research looks at how principals use adaptive leadership to help high school teachers transition to the digital age. Qualitative techniques were used to conduct in-depth interviews with 5 principals and 5 teachers in Jakarta City. Triangulation helped ensure the integrity and trustworthiness of the data. Findings indicate that the adaptive leadership practices of principals make substantial contributions to enabling digital transformation. Behaviors that emerge from the adaptive leadership of principals include (1) developing fresh ideas for organizational goals, (2) creating a collaborative culture, (3) creative behavior, (4) developing an innovative school culture, (5) building strong trust and (6) providing space for teachers to enhance their talents. These behaviors not only enhance teachers' digital competency but also create an innovative school ecology that can respond to technological upheaval. The report recommends that educational stakeholders emphasize leadership development programs to educate principals with adaptive leadership abilities, allowing them to successfully assist teachers in adopting digital technology for improved educational results.

Keywords: Adaptive Leadership, Principal, Teacher Digital Transformation, Disruption Era

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A. INTRODUCTION

Teachers in the digital age are dealing with rapid changes. Teachers must have exceptional digital competency in order to stay up with pupils' diverse qualities (Caena & Redecker, 2019; Starkey, 2020). The goal is to make the teaching and learning process more effective and efficient by allowing them to teach more creatively with technology. Improving digital pedagogical skills is one sign of competency (Howard et al., 2021; Revuelta-Domínguez et al., 2022; Rubach & Lazarides, 2021). Teachers must be able to not only develop engaging learning media, but also use the internet for learning materials and social media for learning. This is very similar to the competence of 21st century teachers, which is to have high digital abilities and literacy.

Teachers' digital competency is strongly linked to their ability to use information and communication technology. According to Mishra & Koehler (2006), the use of suitable technology in learning is a cooperation of pedagogy (P), content (C), and technology (T), which results in intersections and areas of concentration that demonstrate that teachers may develop input from classroom learning. Teachers must be able to use technology to enhance classroom

learning for pupils. Because using digital technology in the classroom can boost creativity, motivation, and student engagement (Tang et al., 2022). Seufert & Scheffler (2018) emphasize this by stating that the usage of digital technology can assist students learn employment skills such as communication skills, creativity, and the capacity to work in teams. In accordance with digital competence, teachers are no longer the sole source of learning, as students can study and master topics that teachers have not or have not mastered.

According to the European Commission in the digital era, teachers must adhere to the pillars of digital capabilities which include aspects (1) Professional engagement, the use of information technology in this area is not only as a learning support but also as a professional liaison with students, parents and groups who have the same interests. (2) Digital devices, teachers can take advantage of the diversity of technology products that provide learning effectiveness and efficiency. (3) Learning and teaching, teaching and learning activities can be interpreted more broadly when viewed from the presence of technology, its presence can make teachers free to develop learning formats, bridge collective interactions or personal guidance to students more freely. (4) Assessment, the role of technology in learning assessment can be used as a maker or monitoring device and as a continuous teaching strategy. (5) Student empowerment, technology can be adjusted to the learning needs of the students themselves so that teachers can also provide learning freedom without reducing the existence of the teacher through the selection of learning tools or media, measuring learning outcomes, empowering students through technology and fostering digitalization skills in students (Rubach & Lazarides, 2021).

The concept of teachers' professional digital competence still appears to be ambiguous and elusive. Falloon (2020) expanded the TPACK framework to include personal-ethic and personal-professional competencies, addressing ethical, safe, and productive functioning in diverse, digital environments for a new TDC framework. The two new sets of personal-competencies are very important to the use of AI and metaverse in education. Skantz-Åberg et al. (2022) could distinguish seven recurring aspects of teachers' professional digital competence; 1) technological competence, 2) content knowledge, 3) attitudes to technology use, 4) pedagogical competence, 5) cultural awareness, 6) critical approach and 7) professional engagement, with the technological and pedagogical competences as the most prominent.

In addition to technical skills, teachers must be able to effectively integrate digital resources into their teaching practices. Designing interactive and engaging learning experiences using technology can improve student comprehension and involvement (Diachuk, 2024; Falloon, 2020). They must also control the social dynamics of digital interactions to ensure that technology promotes rather than inhibits social learning (Rustandi et al., 2024). Professional training and institutional resources are frequently used to help people improve these skills (Bandura, 2023; Caena & Redecker, 2019). Access to technology infrastructure and supportive education policies are crucial for the development of TDC. Schools that give enough resources and training opportunities allow instructors to improve their digital competence more effectively (Rustandi et al., 2024; Zhou et al., 2023). Teachers' self-efficacy, work happiness, and attitudes towards technology all have a substantial impact on their digital competence. Those with better self-efficacy and positive views toward technology have

higher levels of digital competence (Zhou et al., 2023). Teachers in schools with a rich informational environment are more likely to be digitally competent.

In 2020, the Indonesian Child Protection Commission and the Indonesian Teachers' Union Federation conducted distance learning research involving 602 teachers from 14 provinces, revealing that only 8% of teachers understand the use of gadgets/cellphones in learning, while 53% of teachers in schools remain focused on basic student competencies without changing learning patterns or targets during the pandemic. These findings reveal that Indonesian teachers are still hesitant to use digital infrastructure to assist learning in schools and have failed to make learning engaging and pleasurable in response to student requirements. This implementation is still far from what was conveyed: professional teachers who educate without isolating students from the latest developments such as the internet and social media, but instead use technology features and platforms to support innovation and the educational function of teachers in order to achieve learning objectives. According to a survey conducted by the Center for Data on Technology and Information on Education and Culture, 60% of teachers are unable to use technology in the classroom, with the majority falling into the category of technological stutters. This discovery is undoubtedly a complex topic, as the heart of education, namely instructors, lacks competency. It is evident that instructors' lack of digital competency has a direct impact on teachers, including the ongoing learning process. According to a poll conducted by the Ministry of Education and Culture's Technology and Communication Center, just 40% of non-information and communication technology (ICT) teachers are prepared to use technology. As a result, technological mastery is achieved.

Principals that display visionary leadership can encourage instructors to use digital tools and approaches. This leadership style entails establishing clear goals for digital integration and outlining a strategy for accomplishing them (Janette & Anne, 2014). Effective leadership aimed at making the right and intelligent judgments, as well as encouraging leaders to have a broad and deep viewpoint, communicate and interact, and have high creativity and innovation, is critical to meeting today's difficulties (Lestari et al., 2024). Effective principals provide mentoring and support to their teachers, which is critical for promoting digital literacy. This involves offering resources, training, and encouragement to try out new digital tools and instructional methods (Flanagan & Jacobsen, 2003; Ottestad, 2013). Principals have a significant role in supporting professional development opportunities that focus on digital competencies. This includes holding workshops, seminars, and collaborative learning sessions to improve teachers' skills (Wei et al., 2017; Zeng et al., 2024).

During the COVID-19 epidemic, school principals displayed adaptive leadership by implementing techniques such stakeholder involvement, resource management, and curricular contextualization (Famero, 2024). Adaptive leadership is critical for dealing with curriculum changes. Principals that adopt this leadership style assist teachers in their duties as change implementers and collaborators, promoting a smooth transition and effective curriculum implementation (Haber-Curran & Tillapaugh, 2013; Pak et al., 2020; Wolfe, 2015). Adaptive leadership, with its emphasis on collaborative problem-solving using diverse viewpoints, is particularly suitable to large companies dealing with complex problems involving several stakeholders (Nelson & Squires, 2017).

Adaptive leadership necessitates organizational agility in the face of numerous types of change (Raney, 2014; Uhl-Bien & Arena, 2018). Adaptive leadership is concerned not only with how an organization can adapt to various types of changes, but also with how leaders can inspire their subordinates to change, foster a culture of change, and be flexible and solution-oriented in reacting to existing difficulties (Maulana et al., 2024). Adaptive leadership is a dynamic process, not a single individual. It is the primary driver of organizational development (Uhl-Bien et al., 2007). Adaptive change occurs when previously incompatible ideas, information, and technology collide, resulting in new understanding, creativity, learning, and adaptability.

The principal's adaptive leadership is a critical basis for addressing the difficulties of the disruption period, in which digital transformation is an imperative necessity for teachers. Adaptive principals can read the changing times, map teachers' requirements, and provide novel solutions to guarantee that technology is integrated into the learning process. Not every teacher has adequate technological ability. Many of them, particularly those with extended careers, struggle to keep up with the ever-changing advances in technology. Based on this, the research question is how is the adaptive leadership behavior of principals in supporting the digital transformation of high school teachers in Jakarta?

B. METHOD

This study employs a qualitative approach to investigate in depth the phenomena of adaptive leadership of principals as the primary pillar in the digital transformation of teachers in the age of disruption. This study was done in Jakarta's State High Schools, with a focus on understanding how principals use adaptive leadership tactics to enable digital change in the school environment. This study's data sources included both primary and secondary data. Primary data were gathered through in-depth interviews with principals and teachers who were directly involved with the digital transformation project. Secondary data included official school documents, education policies linked to digitalization, and reports on the deployment of technology in schools.

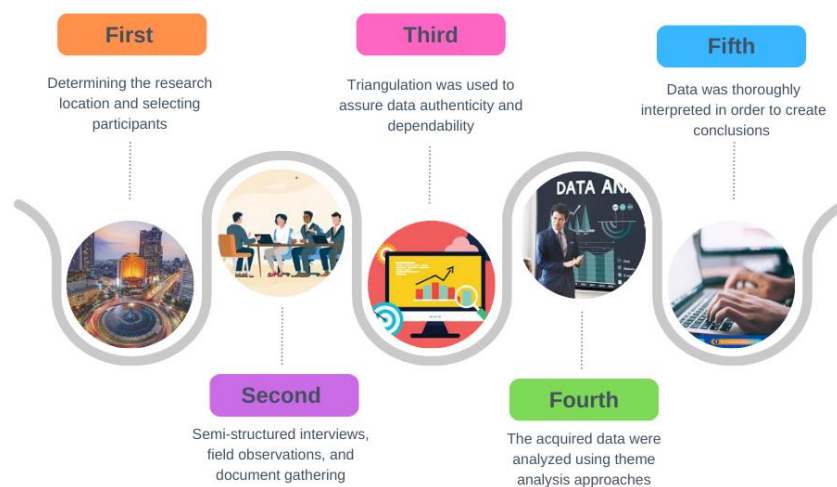


Figure 1. Flow Chart of Research

The research process began with determining the research location and selecting participants through purposive sampling based on characteristics such as the principal's experience leading digital transformation, school technological readiness, and teacher involvement in the digitalization program. Following that, data was gathered via structured and semi-structured interviews, field observations, and document gathering. To assure the accuracy of the data, each interview was recorded and transcribed. Triangulation was used to assure data authenticity and dependability. In-depth interviews were conducted to elicit the principals' viewpoints on the role of adaptive leadership in driving digital transformation, while field observations were used to learn about the practical execution of digitalization policies. Furthermore, materials such as digital curriculum and technology usage guidelines were examined to give context and support for the research findings. The acquired data were analyzed using theme analysis approaches. The analysis approach began with data coding to identify major themes emerging from interviews, observations, and documents. Furthermore, these topics were organized to describe the interaction between principals' adaptive leadership and teachers' digital transformations. Data was thoroughly interpreted in order to create conclusions that were comprehensive and relevant to the research aims.

C. RESULTS AND DISCUSSION

1. Results

The principal's adaptive leadership describes the habit of identifying changing technological needs in education and guiding staff to mastery of digital technologies. The principal must set policies that support technology-based instruction, offer enough resources, and foster an environment that promotes experimentation and continual learning. The principal listens to teachers' need and concerns and gives opportunities for teachers to collaborate in using technology to increase teaching effectiveness. Table 1 below shows the principal's adaptive leadership behavior in boosting teachers' digital competency.

Table 1. Adaptive Leadership Behavior of Principal

Responden	Behaviors of Principal
Principal 1	Every year, we conduct supervision to see the management of teaching. In that session, we can identify teachers who have creative ideas. We hold discussions to explore these ideas and see which ones can be implemented in schools. In addition, we look for suitable applications to support these ideas, although sometimes there are funding constraints
Principal 2	Collaboration is very important, especially in Jakarta which is dubbed as a city of collaboration. We want all school residents to progress together and education can be enjoyed by all. In the school community, we build a habit of sharing and helping each other, both between schools and internally
Principal 3	Yes, funding from school operational assistance and education operational assistance allows us to collaborate with training institutions for library training, administration, and other digital skills

Principal 4	For teacher competency, we collaborate with training institutions, and if there are no external parties, we encourage independent training with modules from the Ministry of Education
Principal 5	Trust is built through good communication. I always try to get close to the teachers and create a comfortable atmosphere. When there is a problem, I prefer to discuss it directly rather than calling them to the office. This way, they feel freer to share their problems. Next, I prefer to lead by example rather than command. For example, I always come in early, greet the students, and supervise the class. The teachers know that I am present and monitoring them without having to pressure them.

The principal's adaptive leadership efforts to improve teachers' digital competency are characterized by a collaborative and inclusive approach (principals 1 and 2). Every year, the principal conducts a supervision to review teaching management, which includes not only assessment but also the identification of teachers with innovative ideas. Despite funding constraints, the principal arranges conversations to examine teachers' ideas and hunt for applicable applications to promote their adoption in schools. The principal feels that collaboration is a key aspect of the organization, both within and across schools, by instilling habits of sharing and aiding one another. This is consistent with Jakarta's culture as a collaborative city, which stresses education for all students while fostering mutual advancement through creative collaboration.

The principle's adaptive leadership is also evident in his or her proactive attempts to use diverse available resources (principal 3). The principle viewed digital training as an essential component of teacher competency development (principal 4). To do this, the principal partners with training institutes. When external training is not accessible, the principal supports the implementation of individual training using a portal that includes modules offered by the Ministry of Education. In reality, cash from school operational aid helps to finance programs. As a result, the principal exhibits adaptive leadership that is responsive to the demands of teacher professional development in dealing with the problems of education digitalization.

Another way to increase teachers' digital competency is to foster excellent teamwork. According to the principle, one of the most essential aspects to enhancing teacher engagement is developing trust via effective communication and creating a welcoming environment. The principal likes to approach teachers personally to discuss difficulties, which makes them feel more comfortable sharing them. The principal also underlined the significance of honesty and openness in policymaking, as well as empowering teachers based on their skills. This not only builds trust, but it also develops teachers' sense of justice, which can drive them to continue developing, particularly in terms of digital competence.

Adaptive leadership is becoming increasingly crucial in education, particularly given the fast changes in the educational system, social expectations, and global concerns. Table 2 shows how teachers perceive senior high school administrators' adaptive leadership actions in Jakarta.

First, the principle generates fresh ideas for organizational goals. According to the interviews, one of the principal's key leadership responsibilities is to provide new ideas for organizational goals. One of the concepts offered is the merging of numerous platforms into a

single centralized application to satisfy all school needs, perhaps reducing instructors' burden. This demonstrates the principal's attempts to increase operational efficiency and simplify administrative tasks that have previously been a burden for instructors.

Second, the principal cultivates a collaborative atmosphere. Collaboration occurs not just among fellow instructors, but also with other institutions in a variety of activities such as seminars and training. Teachers obtain new information and form professional networks as a result, which strengthens their ability to tackle diverse learning problems.

Third, the principal exhibits inventive conduct. The principal actively encourages instructors to think creatively and generate unique concepts. He uses technology, such as online learning platforms and chat groups, to share instructional resources and propose fresh teaching approaches that incorporate the most recent facts. Thus, creativity is cultivated not just in the context of instruction, but also in communication and teamwork.

Fourth, the principal establishes an innovative school culture. One of the principal's attempts to build this culture is to arrange seminars and training sessions involving training institutions, particularly those linked to technology-based learning, whether from the Ministry of Education or other training institutions. This is critical because instructors do not feel alone when confronted with obstacles, but rather as members of a learning community.

Fifth, the principal establishes strong trust. The principal employs a variety of strategies to foster a trusting environment. One method is to become closer to the team members, which he prefers to do by discussing directly with the professors in order to establish a comfortable and open environment. The principle also stresses transparency and honesty in policy decisions. To ensure that no one feels unfairly treated, all policies are developed in collaboration with the team.

Sixth, the principal allows team members to enhance their talents. The principle emphasizes the need of teacher development, particularly in the contemporary digital environment. The principle offers chances for teachers to learn and develop in groups or on their own, both within and outside of school. The principal also undertakes weekly supervision to identify teachers' potential and innovation. These supervision meetings allow for a deeper exploration of creative ideas through talks, which may later be applied in classrooms.

Table 2. Teachers' Perceptions of the Principal's Adaptive Leadership Behavior

Aspect	Teacher's Perception
Developing fresh ideas	The principals welcome change and use it to achieve school goals. They may produce new ideas that are customized to changing demands. Principals motivate teachers to take an active role in events.
Creating collaborative culture	The principal includes team members in decision making and issue solving. This motivates everyone to help improve school performance.

Creative conduct	The principal pushes team members to use their imaginations, come up with fresh ideas, and try out various strategies. Leadership creativity frequently enables teams to more successfully handle unforeseen obstacles.
Developing innovative school culture	The principal establishes and reinforces an organizational culture that fosters cooperation, creativity, and trust. The culture that is created will have an impact on how people work, how they interact with one another, and how well they achieve common goals.
Developing strong trust	The principal fosters and sustains confidence among team members. This trust is built on honesty, open communication, and consistency in action.
Providing room for team members to improve their talents	The principal encourages team members to develop and improve by offering training, coaching, and challenges that push them beyond of their comfort zones.

These findings show that the principal's adaptive leadership has an influence not just on administrative efficiency, but also on boosting learning quality and transforming teachers' digital skills.

2. Discussion

Disruption era typified by quick and unpredictable change, the notion of adaptable leadership is extremely important. The capacity to direct and guide followers so that they are constantly prepared to meet change is at the heart of adaptive leadership. This demonstrates how adaptable leaders empower their team members to anticipate and respond to change quickly and effectively. Heifetz offers a deeper grasp of the notion of adaptive leadership, which pushes followers to adjust to changing situations in order to endure till the end. This demonstrates that adaptable leaders not only deal with change themselves, but also assist others in adapting (Miller et al., 2022).

Adaptive leadership emphasizes on flexibility, collaboration, and adjusting to new situations. Leaders who use this approach view schools as complex systems influenced by a variety of internal and external influences. They establish an environment of continuous learning, stimulate new thinking, and empower both staff and students to help address challenges (Özen & Turan, 2017). Furthermore, Chughtai et al. (2024) suggest adaptive leadership as a mediator for learning organizations, change self-efficacy, and organizational innovations. The study's findings imply that adaptive leadership is critical not just for individuals' increased change self-efficacy, but also for organizational innovation through the use of the learning organization phenomena.

Developing a network communication culture in future teachers dramatically improves their digital literacy and communicative ability (Falloon, 2020; Kerimbayeva et al., 2024). The present study looks at teachers' viewpoints and experiences with digital leadership, as well as principals' technology competencies. Principals must first exhibit digital leadership by actively promoting the development of a digital learning culture in their schools (Karakose et al., 2021). Even in Malaysia, the level of digital leadership demonstrated by principals and teachers'

digital teaching practices are at a high level (Hamzah et al., 2021). Effective leadership of principals promotes the formation of an atmosphere that fosters digital integration, hence improving teachers' capacity to use technology in their teaching methods (Karakose et al., 2021; Zheng & Ye, 2024).

The findings on principals' assessments of adaptive leadership behavior among teachers highlight the significance of leadership in encouraging creativity and cooperation in schools. Principals who embrace change are viewed as critical to accomplishing corporate goals by providing new ideas that address changing needs (Leithwood et al., 1999; Mei Kin et al., 2018; Tai & Abdull Kareem, 2019). They encourage instructors to actively participate in school activities, hence increasing engagement and collective progress. Principals foster a collaborative culture by including teachers in decision-making processes, allowing them to make important contributions to problem resolution and school performance improvement.

Furthermore, leaders demonstrate creative behavior by encouraging team members to utilize their creativity and experiment with different ideas, allowing teams to effectively manage unanticipated obstacles. They also promote an innovative educational culture that values trust, cooperation, and creativity, which has a good impact on interpersonal relationships and goal attainment. Trust-building is another critical feature (Weinstein et al., 2019), since principles encourage honest communication and consistent conduct, which boosts team members' confidence. Furthermore, by offering chances for professional development, such as training and coaching, principals assist their staff in improving their abilities and pushing themselves beyond their comfort zones, assuring continual growth and performance.

To effectively manage the digitization of education, adaptive leadership and teacher preparedness are critical (Wang et al., 2023). To promote teacher readiness and effectiveness in the digital era, adaptive leadership strategies must be implemented. Mailizar et al. (2022) stated that one proactive method is to provide ongoing professional development opportunities for teachers, focusing on technology integration and digital literacy abilities. Principals who use this leadership technique can help teachers perform better by creating an environment favorable to digital integratio (Saeed & Kang, 2024). Stakeholder involvement and the establishment of Professional Learning Communities are practices that promote cooperation and creativity, ultimately leading to better educational results (Rasdiana et al., 2024).

Adaptive leadership requires an understanding of complex adaptive systems. This strategy entails decentralizing control and authority, developing a shared vision among all school stakeholders, and embracing continual emergence to adapt to changing situations (Kershner & McQuillan, 2016; McQuillan & Kershner, 2018). Budget constraints and cultural adaptations are common problems for new principals. To solve these obstacles, adaptive leadership allows them to strengthen stakeholder connections, empower teachers, and promote collaborative planning methods (Leopardas et al., 2024). Adaptive leadership in poor school situations entails developing new and inventive solutions to deal with policy shifts. Principals prioritize developing effective approaches for their individual contexts as well as meeting societal demands (Bhengu & Myende, 2016).

Applying a complexity perspective to adaptive leadership assists principals in navigating the complex dynamics of educational transformation. This approach highlights the importance of relationship trust, school culture, and authority distribution via decentralized networks (Kershner & McQuillan, 2016; Miller et al., 2022). Developing excellent leadership skills among school principals is critical to improving institutional effectiveness. Balancing administrative tasks with visionary leadership promotes collaboration and involvement in the school community (Vorontsova & Dakhari, 2024). The creation of a multidimensional complex adaptive leadership scale for school principals emphasizes the significance of the enabling, managerial, and adaptive leadership components. This scale helps examine and improve adaptive leadership techniques (Özen & Turan, 2017).

Adaptive leadership developed by DeRue (2011) explains how repeated patterns of leading-following interactions result in emergent leader-follower identities, connections, and social structures that allow organizations to develop and adapt in dynamic environments. Randall & Coakley (2007) applying the adaptive leadership process with six steps (1) Identify the type of problem: every day issues with common solutions; adaptive: challenging, new, uncommon situations. (2) Focusing attention: Get people to pay attention to key issues. Secure commitments from those who will help you sell the initiative. Engage those who have yet to climb on board with the change issue. Adopt the behavior you expect from others, and take responsibility for problems facing the organization. (3) Frame the issues: Determine the time when issues must be presented to stakeholders, and focus on the opportunities such problems can provide. This is aided by employing the “discovery process” -stepping back and seeing the big picture. (4) Secure ownership: Sustain the conditions through which stakeholders take responsibility for problem solving and better adapted to the politics, culture, and history of their situation. Place the work where it belongs. Challenge employees’ expectations. (5) Manage stakeholder conflict and maintain stress: Stakeholders with different agendas need to be aligned to achieve a higher purpose, while confronting conflict resulting from stakeholders’ personal issue Uphold the productive stress required for change to occur. (6) Create a safe haven: Counterproductive measures need to be minimized by slowing pace of change and creating a secure place to discuss disparate perspectives.

D. CONCLUSIONS AND SUGGESTIONS

The twenty-first century principal leadership is a leadership model that is increasingly being referred to, especially in an effort to make the idea of a relevant and adaptive leadership model more understandable and acceptable. The main characteristic of this leadership model is the readiness to face various challenges that will be faced. In addition, because of their great curiosity, principals have a tendency to continue learning. As a result, their leadership skills and characteristics become creative and appropriate to current circumstances. The adaptive leadership of principals in improving teacher digital competence involves the ability to recognize changing technological needs in education and direct teachers towards mastery of digital tools. By adopting this leadership model, principals can effectively respond to the various needs and challenges faced by teachers in integrating technology into their teaching practices. Principals who lead adaptively emphasize the importance of feedback, mentoring, and collective problem solving to create an environment of mutual support and trust. So that

teachers feel motivated and able to embrace digital innovation, which ultimately leads to improved teaching quality and student learning outcomes. In conclusion, adaptive leadership serves as a catalyst for transformative change, equipping teachers with the digital skills needed to effectively navigate the dynamic modern educational landscape.

This study has several limitations. *First*, the study may not be generalizable if the study focuses on a specific educational context or region, as adaptive leadership practices can vary widely across cultural and institutional settings. *Second*, the reliance on qualitative methods, such as interviews or case studies, may limit the ability to draw statistically significant conclusions. Suggestions that can be made include: Future research can expand the scope of the study to include regions, types of schools, and cultural settings and combine qualitative and quantitative approaches so that the data produced is more robust.

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