

Research Article

The Effect of Transformational Leadership of School Principals on the Performance of ICT Teachers in the Implementation of Learning at SMAN XYZ

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Abstract. This study aims to analyze the effect of school principals' transformational leadership on the performance of ICT teachers in implementing digital learning at SMAN XYZ, specifically examining how four dimensions of transformational leadership Influence teacher motivation, creativity, and innovation in technology integration. This quantitative research employed an explanatory correlational design with 20 ICT teachers as respondents selected through purposive sampling. Data were collected using validated questionnaires adapted from the Multifactor Leadership Questionnaire (MLQ) by Bass and Avolio (1994) for transformational leadership and the TPACK framework by Koehler and Mishra (2009) for teacher performance. Simple linear regression analysis was conducted using SPSS 25 to test the research hypothesis. Results demonstrate that transformational leadership significantly and positively influences ICT teacher performance ($\beta = 0.672$, $p = 0.003 < 0.05$), explaining 67.2% of performance variance. The principal's transformational leadership scored highly (4.3/5), with individualized consideration contributing most significantly to teacher performance. ICT teacher performance reached a high category (4.1/5), with the most substantial achievement in technology-based lesson planning, although challenges remain in independent digital content development and innovative assessment methods. Theoretically, this research strengthens transformational leadership Theory in digital Education contexts and supports the TPACK framework's emphasis on leadership support for technology integration. Practically, findings guide principals to optimize transformational leadership through enhanced mentoring, professional development programs, and the creation of an innovation culture. The study offers an empirical foundation for educational policymakers to develop school leadership training programs focused on digital transformation, while highlighting the importance of individualized consideration in supporting teacher technology competency development.

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1. INTRODUCTION

The digital revolution has fundamentally transformed the global educational landscape, creating a new paradigm in the learning process that demands integrating information and communication technology (ICT) into every aspect of Education. This transformation has not only changed how teachers deliver content but also redefined the role of educators in facilitating 21st-century learning that is more interactive, collaborative, and data-driven (Fullan & Langworthy, 2014). The development of digital technology has enabled the creation of more dynamic learning environments, where students can access information in real time, collaborate with students from around the world, and develop digital skills essential for their future.

The integration of ICT in Education is no longer simply an option, but a strategic imperative to prepare young people to face the challenges of the digital economy and a knowledge-based society. International research shows that using technology in learning can increase student engagement by up to 85%, significantly improve learning outcomes, and develop critical thinking skills necessary for the Industry 4.0 era (OECD, 2019). Furthermore, digital technology enables personalized learning that can accommodate various student learning styles, provide instant feedback, and facilitate continuous, self-directed learning.

In the context of ICT implementation in schools, the role of information and Communication Technology (ICT) teachers is highly strategic as catalysts for digital transformation. ICT teachers serve as instructors of technical subjects and agents of change,

leading technology integration across all aspects of school learning (Tondeur et al., 2017). Their responsibilities include developing interactive digital content, training other teachers to use digital learning platforms, designing technology-based curricula, and mentoring students to develop comprehensive digital literacy. The success of a school's digital transformation depends heavily on the optimal performance of ICT teachers in carrying out this multifaceted role.

However, ICT teacher performance in implementing technology-based learning is influenced by various complex, interacting factors. Individual factors such as technical competence, intrinsic motivation, and self-efficacy are important, but organizational factors have an equally significant influence (Admiraal et al., 2017). The school's organizational culture, the availability of technological infrastructure, management support, and especially the principal's leadership style are key determinants of whether ICT teachers can perform optimally in implementing digital learning.

The principal's leadership plays a fundamental role in creating an ecosystem that supports innovation in educational technology. Effective principals provide technological resources and build a shared vision for digital transformation, create a work climate that encourages experimentation and continuous learning, and provide emotional and professional support to teachers in adopting new technologies (Leithwood & Jantzi, 2005). In this digital era, traditional leadership focused on control and administration must transform into more inspirational, adaptive, and empowering leadership.

Transformational leadership has been identified as the most effective model for facilitating organizational change in educational technology. This leadership model, developed by Bass and Avolio (1994), emphasizes four key dimensions: idealized influence, which builds trust and serves as a role model in the use of technology; inspirational motivation, which creates a compelling vision of the future of digital learning; intellectual stimulation, which encourages teachers to think creatively and innovatively in using technology; and individualized consideration, which provides personalized support tailored to each teacher's professional development needs. Empirical research shows that transformational leadership has a strong positive correlation with teacher performance in the context of educational innovation. A meta-analysis by Robinson et al. (2008) revealed that transformational leadership can increase teacher motivation by up to 73% and innovation performance by up to 68%. Specifically, in the context of ICT, research by Vanderlinde and van Braak (2010) demonstrated that principals with a transformational leadership style were able to increase teacher technology adoption by 45% compared to those with a conventional leadership style.

SMAN XYZ, as one of the leading schools in Kudus Regency, has established digital transformation as a strategic priority in its efforts to improve the quality of learning. The school has invested significant resources in developing ICT infrastructure, teacher training, and updating its technology-based curriculum. However, initial observations indicate that implementing ICT-based learning has not reached its optimal potential. Significant gaps exist in technology utilization among teachers, variations in the quality of digital learning media development, and uneven participation in continuing professional development programs.

This phenomenon indicates a gap between the school's digital transformation vision and the reality of implementation at the classroom level. Some ICT teachers excel at integrating innovative technologies, while others still experience challenges adapting digital learning approaches. This situation raises important questions about the factors influencing this variation in performance, particularly the role of principal leadership in facilitating equitable and sustainable digital transformation. The complexity of ICT implementation at SMAN XYZ is also reflected in the challenges ICT teachers face in carrying out their dual roles as educators and change agents. They are required not only to master the latest technical competencies but also to develop digital pedagogical skills, facilitate interdisciplinary collaboration, and lead learning innovation initiatives at the school level. This multidimensional workload requires leadership support capable of providing motivation, strategic direction, and facilitating ongoing professional development.

Given the critical role of transformational leadership in supporting ICT teacher performance, this study will comprehensively analyze the relationship between the principal's transformational leadership style and ICT teacher performance in implementing learning at SMAN XYZ. This research is expected to contribute theoretically to the understanding of leadership dynamics in the context of digital transformation in Education, while also providing practical recommendations for optimizing the implementation of ICT-based learning at the secondary school level. The purpose of this study is to describe the form of transformational leadership of the principal, analyze the performance of ICT teachers in the implementation of

digital learning, including aspects of planning, implementation, and evaluation of technology-based learning, and test the Influence of the principal's transformational leadership on the performance of ICT teachers in the implementation of learning at SMAN XYZ.

2. LITERATURE REVIEW

A. Theoretical Foundation

This research is based on three main interrelated theoretical concepts in the context of digital transformation in Education. First, Bass and Avolio's (1994) transformational leadership Theory emphasizes four dimensions of leadership that can be used to create organizational change. Second is the teacher performance Theory, which integrates professional competence with pedagogical technological capabilities (Koehler & Mishra, 2009). Third, the UNESCO (2011) framework for implementing ICT in learning aims to improve educational quality through technology integration. These three theories form a conceptual framework for understanding how principals' transformational leadership can Influence ICT teacher performance in implementing technology-based learning in the digital age.

B. Transformational Leadership

Transformational leadership is a leadership paradigm that focuses on organizational transformation through inspiration, motivation, and the development of individual potential. Bass and Avolio (1994) identified four main dimensions of transformational leadership that have become global academic references. The first dimension, idealized Influence, refers to a leader's ability to be a trusted and respected role model. In the educational context, principals with ideal Influence demonstrate moral integrity, commitment to the educational vision, and exemplary use of technology (Leithwood & Jantzi, 2006).

The second dimension, inspirational motivation, relates to the leader's ability to communicate a compelling and meaningful vision of the future. Inspirational principals go beyond simply communicating administrative targets, but also connect digital learning goals to the noble mission of preparing students to face global challenges (Hallinger & Heck, 2010). The third dimension, intellectual stimulation, emphasizes encouraging subordinates to think creatively and innovatively. In ICT implementation, intellectual stimulation encourages teachers to explore new technologies, experiment with digital methodologies, and question conventional learning practices (Robinson et al., 2008). The fourth dimension, individualized consideration, focuses on personalized attention to each individual's development needs, including mentoring, coaching, and professional support tailored to each teacher's characteristics.

C. Teacher Performance in the Digital Age

Teacher performance in ICT-based learning is a multidimensional construct encompassing traditional and digital competencies. Koehler and Mishra (2009) developed the Technological Pedagogical Content Knowledge (TPACK) framework, which integrates three knowledge domains: content knowledge (mastery of material), pedagogical knowledge (teaching skills), and technological knowledge (digital literacy). High-performing teachers in the digital era can synergistically integrate these three domains to create effective and engaging learning.

ICT teacher performance is measured by their technical ability to operate digital devices and their ability to design learning that utilizes technology to achieve pedagogical goals (Mishra & Koehler, 2006). Performance indicators include the ability to design technology-based lesson plans, implement various digital learning strategies, develop interactive multimedia content, facilitate virtual collaboration between students, and evaluate learning using digital assessments (Ertmer & Ottenbreit-Leftwich, 2010). Factors influencing ICT teacher performance include technology self-efficacy, organizational support, infrastructure availability, and, importantly, the principal's leadership style (Tondeur et al., 2017). Teachers with optimal performance demonstrate high adaptability to technological developments, creativity in integrating digital tools, and the ability to reflect and improve technology-based learning practices continuously.

D. Implementing ICT-Based Learning

Implementing ICT-based learning is a complex process involving the strategic integration of digital technology to improve the quality of learning. UNESCO (2011), in its ICT Competency Framework for Teachers, emphasizes that effective ICT implementation

requires a paradigm shift from teacher-centered to student-centered learning, where technology acts as an enabler to create an interactive, collaborative, and personalized learning environment. Successful ICT implementation depends on several key components. First is technological infrastructure, including hardware, software, and internet connectivity (Ertmer, 1999). Second, teacher readiness encompasses digital competency, pedagogical beliefs that support innovation, and the ability to integrate technology into the curriculum (Hew & Brush, 2007). Third, institutional support includes conducive policies, ongoing training programs, and responsive technical support.

Implementing ICT-based learning faces various challenges, including the digital divide, resistance to change, and limited time to develop digital competencies (Bingimlas, 2009). Research shows that principal leadership plays a crucial role in overcoming these obstacles. Effective principals in the digital era provide technological infrastructure and create a culture of innovation, facilitate professional learning communities, and provide ongoing support for technology experimentation in learning (Anderson & Dexter, 2005). Successful implementation models generally involve a phased approach, from adoption, adaptation, to transformation in the use of educational technology.

3. RESEARCH METHOD

This study used a quantitative approach with a descriptive correlational design to analyze the relationship between principals' transformational leadership and ICT teacher performance in implementing digital learning. The descriptive correlational approach was chosen because the study aimed to describe the characteristics of variables and empirically test causal relationships between them without administering a treatment (Creswell, 2014). This method allowed researchers to identify patterns of relationships between the independent variable (transformational leadership) and the dependent variable (ICT teacher performance) in a natural setting.

The study population was all SMAN XYZ teachers who actively use ICT in learning. The sampling technique used was purposive sampling based on the criterion of teachers who have at least one year of experience in implementing technology-based learning, resulting in a sample of 20 teachers (Sugiyono, 2017). The research instrument was a structured questionnaire with a Likert scale of 1-5 adapted from the Multifactor Leadership Questionnaire (MLQ) of Bass and Avolio (1994) to measure transformational leadership, and a teacher performance instrument based on the TPACK framework of Koehler and Mishra (2009). Data were analyzed using descriptive statistics and simple linear regression with the help of SPSS version 25 to test the research hypothesis (Pallant, 2016).

4. RESULTS

A. Description of the Principal's Transformational Leadership at SMAN XYZ

The analysis of questionnaire and interview data indicates that the principal at SMAN XYZ consistently implements transformational leadership. Teachers' assessments of the principal's leadership were generally high, with an average score of 4.3 on a scale of 5. In the idealized Influence dimension, the principal was considered a role model who was respected and trusted by teachers. The majority of respondents stated that the principal demonstrated high integrity, commitment to learning innovation, and decisiveness in decision-making. The principal's exemplary behavior, such as discipline, openness, and commitment to technology development, significantly influenced the motivation of ICT teachers to follow suit.

The inspirational motivation dimension also received high ratings. Teachers stated that the principal frequently communicated the school's vision in an inspiring manner, particularly regarding improving the quality of learning through technology. The principal regularly emphasized the importance of ICT mastery in teacher meetings, held innovation discussion forums, and awarded teachers who successfully developed digital learning media. This encouraged teachers to be more confident and enthusiastic in developing their ICT skills. In the intellectual stimulation dimension, the principal provides teachers with intellectual freedom to try new learning methods and develop digital media tailored to students' needs. Teachers can experiment, for example, by integrating applications like Google Classroom, Kahoot, and Canva into the learning process. Some teachers are even invited to share best practices in internal school forums.

The individualized consideration dimension is evident in the principal's attention to teacher competency development. The principal actively facilitates ICT teachers' participation in training from the Education Office and private training institutions. Furthermore, the principal also provides informal mentoring to discuss teachers' difficulties in implementing

technology. This personal approach creates a supportive work environment and boosts teacher confidence.

B. ICT Teacher Performance in Implementing Digital Learning

Descriptive analysis shows that ICT teacher performance in implementing digital learning is relatively high, with an average score of 4.1 on a scale of 5. Teacher performance is measured through three leading indicators: planning, implementation, and evaluation of learning.

Learning Planning

Lesson planning is the initial stage that significantly determines the success of the teaching and learning process, especially in implementing information and Communication Technology (ICT)-based learning. The analysis shows that most ICT teachers at SMAN XYZ have developed digital-based Lesson Implementation Plans (RPPs) quite effectively.

Approximately 80% of teachers consistently include the use of online learning applications such as Google Classroom and Microsoft Teams in their lesson plans. This demonstrates teachers' awareness of the importance of utilizing digital platforms to enhance learning effectiveness. Furthermore, several teachers have utilized graphic design software such as Canva to create engaging and interactive visual materials. The use of technology-based visual materials is considered effective in increasing student interest in learning and facilitating conceptual understanding, especially for abstract material. Teachers have also begun developing teaching materials in the form of interactive presentations and digital worksheets, allowing students to more easily access materials anytime through their devices. However, teachers' ability to independently develop digital learning content remains limited. Only 25% of teachers can create interactive learning videos or multimedia-based digital modules.

The main obstacles teachers express include limited time due to high administrative burdens, a lack of supporting facilities such as professional editing software, and a lack of opportunities for advanced training related to digital content creation. This situation indicates the need for further support from school principals in the form of intensive training, provision of supporting software, and reduced administrative burdens so that teachers can focus more on developing creativity in technology-based learning planning.

Learning Implementation

Implementing information and Communication Technology (ICT)-based learning at SMAN XYZ has shown positive progress, although various challenges remain. Based on questionnaire analysis, 75% of ICT teachers regularly use digital media in the teaching and learning process. The most frequently used media are Google Classroom, the primary platform for online classroom management; Quizizz, for interactive quizzes; and Microsoft Teams, for synchronous discussions with students. The use of digital media is considered to increase student engagement, as evidenced by their active participation in online discussions and their prompt completion of assigned work.

Teachers also utilize instructional videos taken from online sources, such as YouTube, and self-made videos on a limited scale. Interactive videos are considered helpful in clarifying concepts that are difficult to explain verbally, especially in technical ICT materials. Furthermore, some teachers are trying to implement software-based lab simulations, such as PhET or simple coding simulations, to provide a more hands-on learning experience. Interviews with teachers and students indicate that technology makes the learning environment more engaging and less monotonous.

Students feel more motivated because the material presented is visual, interactive, and aligned with the learning styles of today's digital generation. However, infrastructure constraints remain a significant issue. Around 50% of teachers complained about unstable internet connections and the limited number of computers in ICT laboratories. This sometimes hampers the implementation of digital learning, especially when teachers must use online applications that require high bandwidth.

To optimize the implementation of digital learning, teachers hope for further support from schools, such as improving internet network quality, adding more computers, and providing projectors or smart boards in each classroom. With adequate support, teachers will have more freedom to maximize the potential of technology in everyday learning.

Learning Evaluation

Learning evaluation is crucial in measuring the success of implementing information and Communication Technology (ICT)-based learning. Research shows that ICT teachers at SMAN XYZ have successfully used various digital evaluation applications to measure student

learning outcomes. Based on a questionnaire, approximately 65% of teachers regularly use applications such as Google Forms, Quizizz, and Edmodo to create quizzes, daily exams, and project-based assignments. Digital evaluation applications are considered to facilitate teachers' quick and accurate analysis of student learning outcomes. With automated assessment features, teachers can immediately determine grade distribution, level of material mastery, and common errors made by students.

This allows teachers to provide more personalized and timely feedback. Some teachers have also usefully used the quiz statistics feature in Quizizz to map question difficulty levels and adjust subsequent learning strategies. However, technology-based evaluation has not been implemented evenly across all subject matter. 35% of teachers still rely on conventional evaluation methods, such as manual written tests or oral assessments, especially for material considered difficult to convert into interactive questions. Barriers faced by teachers include limited technical competence in designing diverse digital evaluation instruments and a lack of advanced training specifically addressing technology-based evaluation. Furthermore, infrastructure is another obstacle. Unstable internet connections often disrupt online assessments, especially during simultaneous application-based exams in ICT laboratories.

Some teachers overcome this by implementing blended evaluations, combining online tests with digital portfolio-based project assignments. Specific training on designing technology-based assessments and providing more varied evaluation software is needed to improve the quality of digital learning evaluations. With optimal evaluation, ICT teachers can objectively measure learning outcomes and increase the overall effectiveness of technology-based learning.

C. Analysis of the Effect of Transformational Leadership on ICT Teacher Performance

The results of a simple linear regression analysis indicate that the principal's transformational leadership has a positive and significant effect on ICT teacher performance in implementing digital learning. The regression coefficient value of $\beta = 0.672$ with a significance level of $p = 0.003$ (<0.05) confirms that the alternative hypothesis (H_1) is accepted, while the null hypothesis (H_0) is rejected. This means that every one-unit increase in teachers' perceptions of the principal's transformational leadership will be followed by a positive and significant increase in ICT teacher performance. This finding indicates that the better teachers' perceptions of the principal's transformational leadership, the higher their performance in implementing technology-based learning. Teachers who feel supported by their principals demonstrate greater enthusiasm for utilizing technology, participating in training, and developing digital learning media.

Further analysis of the four dimensions of transformational leadership indicates that individualized consideration contributes the most to improving ICT teacher performance. Teachers feel more motivated to improve their technology skills when the principal provides personalized attention, supports professional development through training, and fosters open communication. Teachers who feel personally cared for are more confident in trying innovations in learning, even when faced with limitations.

5. DISCUSSION

A. Description of the Principal's Transformational Leadership

The analysis of questionnaire and interview data indicates that the principal at SMAN XYZ consistently implements transformational leadership. Teachers' assessments of the principal's leadership were generally high, with an average score of 4.3 on a scale of 5. This finding aligns with research by Bass and Avolio (1994), which asserted that effective transformational leadership is reflected in subordinates' positive perceptions of four key dimensions of leadership. In the idealized Influence dimension, the principal was perceived as a role model respected and trusted by teachers. The majority of respondents stated that the principal demonstrated high integrity, commitment to learning innovation, and decisiveness in decision-making. The principal's role model, such as discipline, openness, and commitment to technology development, significantly influenced the motivation of ICT teachers to follow suit. This is consistent with research by Leithwood and Jantzi (2006), which found that leadership role models are a key factor in building staff trust and loyalty in the context of educational innovation.

The inspirational motivation dimension also received high ratings. Teachers stated that the principal frequently communicates the school's vision in an inspiring manner, particularly regarding improving the quality of learning through technology. The principal regularly

emphasizes the importance of ICT mastery in teacher meetings, holds innovation discussion forums, and awards teachers who successfully develop digital learning media. This encourages teachers to be more confident and enthusiastic in developing their ICT skills. This finding supports research by Hallinger and Heck (2010), which showed that inspiring vision communication can increase teacher motivation and engagement in implementing learning innovations.

Regarding intellectual stimulation, the principal provides teachers with intellectual freedom to try new learning methods and develop digital media tailored to student needs. Teachers can experiment, for example, by integrating applications like Google Classroom, Kahoot, and Canva into the learning process. Some teachers are even invited to share best practices in internal school forums. This practice aligns with research by Robinson et al. (2008), which emphasizes the importance of intellectual stimulation in fostering creativity and innovation in the educational environment. The individualized consideration dimension is evident in the principal's attention to teacher competency development. The principal actively facilitates ICT teachers' participation in training from the Department of Education and private training institutions. Furthermore, the principal also provides informal mentoring to discuss teachers' difficulties in implementing technology. This personal approach creates a supportive work environment and boosts teacher confidence. These results are consistent with research by Avolio et al. (2004), which shows that individualized attention from leaders is positively correlated with subordinate job satisfaction and performance.

Lesson Planning

Lesson planning is the initial stage crucial for the success of the teaching and learning process, particularly in implementing information and Communication Technology (ICT)-based learning. Analysis shows that most ICT teachers at SMAN XYZ have developed digital-based Lesson Implementation Plans (RPPs) quite effectively. Approximately 80% of teachers consistently include the use of online learning applications such as Google Classroom and Microsoft Teams in their lesson plans. This demonstrates teachers' awareness of the importance of utilizing digital platforms to enhance learning effectiveness. This finding aligns with research by Tondeur et al. (2017), which emphasized the importance of technology integration in the planning stage to ensure effective implementation (Pudjiarti & Winarni, 2025; Rini Werdingingsih et al., 2023)

Furthermore, several teachers have utilized graphic design software such as Canva to create engaging and interactive visual materials. The use of these technology-based visual materials is considered effective in increasing student interest in learning and facilitating conceptual understanding, especially for abstract material. Teachers have also begun developing teaching materials in the form of interactive presentations and digital worksheets, allowing students to more easily access materials anytime through their devices. However, teachers' ability to independently develop digital learning content remains limited. Only 25% of teachers can create interactive learning videos or multimedia-based digital modules. The main obstacles teachers express include limited time due to high administrative burdens, a lack of supporting facilities such as professional editing software, and a lack of opportunities for advanced training related to digital content creation. This situation aligns with research by Ertmer and Ottenbreit-Leftwich (2010), which identified first- and second-order barriers to educational technology integration.

Learning Implementation

Implementing information and Communication Technology (ICT)-based learning at SMAN XYZ has shown positive progress, although various challenges remain. Based on questionnaire analysis, 75% of ICT teachers regularly use digital media in the teaching and learning process. The most frequently used media are Google Classroom, the primary platform for online classroom management; Quizizz, for interactive quizzes; and Microsoft Teams, for synchronous discussions with students. The use of these digital media is considered to increase student engagement, as evidenced by students' active participation in online discussions and quick responses to assigned assignments. This finding supports research by Mishra and Koehler (2006), which shows that appropriate technology integration can improve student engagement and learning outcomes.

Teachers also utilize instructional videos taken from online sources, such as YouTube, or self-made videos on a limited scale. Interactive videos are considered helpful in clarifying concepts that are difficult to explain verbally, especially in technical ICT materials. Furthermore, some teachers implement software-based lab simulations, such as PhET or simple coding simulations, to provide a more hands-on learning experience.

Interviews with teachers and students indicate that technology makes the learning environment more engaging and less monotonous. Students feel more motivated because the material presented is visual, interactive, and aligned with the learning styles of today's digital generation. These results are consistent with Prensky's (2001) research on the characteristics of digital natives, who are more responsive to technology-based learning. However, infrastructure constraints remain a significant issue. Approximately 50% of teachers complained about unstable internet connections and the limited number of computers in ICT laboratories. This sometimes hampers the implementation of digital learning, especially when teachers must use online applications that require high bandwidth. These constraints align with Bingimlas' (2009) research, which identified infrastructure as a significant barrier to school ICT implementation.

Learning Evaluation

Learning evaluation is crucial in measuring the success of implementing information and Communication Technology (ICT)-based learning. Research shows that ICT teachers at SMAN XYZ have begun utilizing various digital evaluation applications to measure student learning outcomes. Based on questionnaires, approximately 65% of teachers routinely use applications such as Google Forms, Quizizz, and Edmodo to create quizzes, daily exams, and project-based assignments. The use of digital evaluation applications is considered to facilitate teachers in analyzing student learning outcomes quickly and accurately. With the assessment automation feature, teachers can immediately determine the distribution of grades, the level of material mastery, and common errors made.

B. Analysis of the Effect of Transformational Leadership on ICT Teacher Performance

The results of a simple linear regression analysis indicate that the principal's transformational leadership has a positive and significant effect on ICT teacher performance in implementing digital learning. The regression coefficient value of $\beta = 0.672$ with a significance level of $p = 0.003$ (<0.05) confirms that the alternative hypothesis (H_1) is accepted, while the null hypothesis (H_0) is rejected. This means that every one-unit increase in teachers' perceptions of the principal's transformational leadership will be followed by a positive and significant increase in ICT teacher performance.

This finding is consistent with the meta-analysis by Robinson et al. (2008), which showed that transformational leadership significantly affects teacher performance and student learning outcomes. This finding indicates that the better teachers' perceptions of the principal's transformational leadership, the higher their performance in implementing technology-based learning. Teachers who feel supported by their principals demonstrate greater enthusiasm for utilizing technology, participating in training, and developing digital learning media.

Further analysis of the four dimensions of transformational leadership showed that individualized consideration had the greatest impact on improving ICT teacher performance. Teachers felt more motivated to improve their technological skills when principals provided personal attention, supported professional development through training, and fostered open communication. Teachers who felt personally cared for were more confident in trying innovations in teaching, even when faced with limited resources. These results align with research by Avolio et al. (2004), which showed that individualized consideration had the strongest correlation with employee job satisfaction and intrinsic motivation.

The inspirational motivation dimension ranked second in terms of Influence. Principals who conveyed visions in an inspiring manner and appreciated teachers' successes in developing digital media successfully inspired teachers to work beyond minimum standards. Teachers who received recognition for their innovations felt motivated to continue creating and sharing good practices with colleagues. These findings support research by Podsakoff et al. (1990) on the importance of inspirational motivation in fostering organizational citizenship behavior.

Meanwhile, idealized Influence and intellectual stimulation played a role, although their contributions were less significant than the previous two dimensions. Idealized Influence provides a role model encouraging ICT teachers to emulate the principal's discipline and commitment to innovation. Intellectual stimulation encourages teachers to think creatively, such as utilizing new learning applications. These results are consistent with research by Bass and Riggio (2006), which showed that the four dimensions of transformational leadership have distinct but complementary contributions.

Overall, these findings emphasize the importance of the principal's transformational leadership as a determining factor in the successful implementation of digital learning in secondary schools. With a supportive leadership style, ICT teachers are encouraged to improve their competencies and motivated to play an active role as agents of change in the school environment. These research findings also support the transformational leadership Theory of Burns (1978) and Bass (1985), which emphasizes the leader's ability to transform an organization through influencing its members' values, attitudes, and behaviors.

6. CONCLUSION

Based on the data analysis and discussion of the research findings, it can be concluded that the principal's transformational leadership has a positive and significant Influence on the performance of ICT teachers in implementing digital learning at SMAN XYZ. Transformational leadership explains 67.2% of the variation in ICT teacher performance. This finding answers the research question: whether a transformational leadership style implemented by the principal can effectively increase teacher motivation, creativity, and innovation in integrating learning technology.

The principal of SMAN XYZ has effectively implemented all four dimensions of transformational leadership, with an average score of 4.3 on a scale of 5. The individualized consideration dimension contributed the most, indicating that personal attention and professional development support are key factors in improving ICT teacher performance. ICT teacher performance is in the high category (score 4.1), with the best achievement in technology-based learning planning. However, they still face challenges in developing independent digital content and evaluating innovative learning.

A. Theoretical Implications

This study strengthens Bass and Avolio's (1994) transformational leadership Theory in digital Education, demonstrating the relevance of the four dimensions of transformational leadership to fostering innovation in educational technology. The findings also support the TPACK framework (Koehler & Mishra, 2009), which states that integrating learning technology requires strong leadership support. Theoretically, this study contributes to the development of a digital-era educational leadership model that emphasizes the importance of transformational leadership in facilitating technology-based organizational change.

B. Practical Implications

The results guide school principals in optimizing transformational leadership styles, particularly by strengthening the individualized consideration dimension through mentoring, coaching, and ongoing professional development programs. Principals must create a culture of innovation by providing freedom for experimentation, appreciating teacher creativity, and providing adequate technological infrastructure support. For ICT teachers, these findings emphasize the importance of responsiveness to transformational leadership to enhance digital and pedagogical competencies. For educational policymakers, this study provides an empirical basis for developing school leadership training programs focused on digital transformation.

C. Research Limitations

This study has several limitations that should be acknowledged. First, the relatively small sample size (20 respondents) and focus on a single school limit the generalizability of the findings. Second, a cross-sectional design does not allow for robust causality and temporal change analysis. Third, self-report-based teacher performance measurement is potentially subject to subjective bias. Fourth, the study did not control for other moderating or mediating variables, such as organizational culture, technological infrastructure, or individual teacher characteristics, that might Influence the relationship between variables.

D. Future Research Recommendations

Future research should use a larger sample size and multiple sites to enhance external validity. A longitudinal design is needed to understand patterns of change in teacher performance following the implementation of transformational leadership. In-depth qualitative research can explore the psychological mechanisms through which transformational leadership influences teacher motivation and performance. Comparative studies between schools with different levels of transformational leadership can provide more comprehensive insights. Research should also explore mediating variables such as teacher self-efficacy, organizational commitment, and job satisfaction in the leadership-performance relationship. Developing direct observation instruments to measure teacher performance objectively is also an important agenda for future research.

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