



The Influence of Character-Based Digital Transformational Leadership on the Quality of Deep Learning and Class management in Elementary Schools

Ninuk Sri Widayati^{1*}, Yuni Ratnasari², Wawan Shokib Rondli³
^{1,2,3}Muria Kudus University, Kudus, Indonesia

ARTICLE INFO

Article history:

Submitted: July 20, 2026
Final Revised: Sept. 04, 2026
Accepted: September 12, 2026
Published: September 28, 2026

Keywords:

Digital Transformational Leadership; Character Education; Deep Learning; Classroom Management; Elementary School



ABSTRACT

Purpose: This study aims to analyze the influence of character-based digital transformational leadership on the quality of deep learning and classroom management in elementary schools. **Methods:** This quantitative study used a survey method with a correlational design. Respondents consisted of 169 elementary school teachers in Juwana Subdistrict, Pati Regency, selected through proportional stratified random sampling. Data were collected using a Likert-scale questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (SEM-PLS). The measurement model results showed that all constructs met convergent validity ($AVE > 0.5$) and composite reliability (Cronbach's Alpha and Composite Reliability > 0.7) after several indicators with low loading factors were removed from the model. **Findings:** The structural model results indicated that character-based digital transformational leadership had a positive and significant effect on the quality of deep learning (path coefficient = 0.761; $t = 6.550$; $p < 0.001$) and on classroom management (path coefficient = 0.738; $t = 5.373$; $p < 0.001$), explaining 57.8% and 54.5% of their respective variances. **Research Implications:** These findings confirm that character-based digital leadership plays a crucial role in creating an ecosystem for deep learning and conducive classroom management in elementary schools, and provide a basis for recommending that principals integrate digital competence with character strengthening simultaneously. **Originality:** The novelty of this research lies in the combination of three main concepts digital leadership, character building, and deep learning applied specifically to elementary school classroom management.



Doi: <https://doi.org/10.61255/jupiter.v4i4.1654>

INTRODUCTION

The development of digital technology in the 21st century has brought significant changes to the world of education, including at the elementary school level, which is the foundation for character development and children's learning competencies. According to Ahmed et al. (2023), Digital transformation requires schools to not only provide technological resources but also to provide leadership capable of directing, guiding, and inspiring the entire school community to adapt and innovate. According to Al Fauziyah et al. (2026), Digital transformational leadership is a relevant leadership model in this context because it combines the ability to utilize technology with the ability to transform school culture in a visionary, collaborative, and innovative manner. Digital transformation in elementary schools is also inseparable from character building, so digital leadership based on the values of integrity, responsibility, empathy, and exemplary behavior is essential in building an ideal learning ecosystem. According to Alshamsi et al. (2025), Field conditions indicate that the use of digital facilities in many elementary schools remains administrative and does not yet lead to in-depth learning that fosters critical thinking, conceptual understanding, and problem-solving skills. Teachers are often unable to facilitate meaningful learning due to limited digital competency and minimal support from visionary leadership. Classroom management in many elementary schools also faces challenges such as low student engagement, lack of behavioral control, and weak positive interactions between teachers and students. Meanwhile, student use of technology is often directed towards entertainment rather than as a learning tool that supports character development and higher-order thinking skills

Several previous studies according to [Al-Aamri et al. \(2024\)](#); [Bahijah et al. \(2025\)](#), have addressed relevant issues, but only partially. Digital transformational leadership can enhance a school's culture of innovation, but did not yet integrate character aspects. Immersive learning can enhance critical thinking skills, but its success is highly dependent on classroom conditions and leadership support. Digital classroom management can increase student engagement, but did not examine how transformational leadership influences this practice. Integrating character education into technology can improve discipline and responsibility, but they did not link these findings to digital leadership. According to [Alshamsi et al. \(2025\)](#), Transformational leadership positively impacts learning quality, although his focus was more on secondary school levels and did not include digital constructs and character. A review of these studies shows that each study is still partial and does not present a comprehensive relationship between character-based digital transformational leadership, deep learning, and classroom management.

According to [Garwood et al. \(2020\)](#); [Kim et al. \(2020\)](#), The main problem in character-based digital transformational leadership lies in the gap between the demands of rapid technology adoption and the moral-cultural readiness of human resources (HR) in the field. This has a direct impact on the quality of classroom management, giving rise to challenges such as disruption of learning focus (distraction), digital literacy gaps, and the threat of ethical value degradation. To understand further, here are the details of the main problems and their impact on classroom management: 1) Main Leadership Problems Inequality of Capacity & Digital Literacy, Not all educators and staff have equal technical capabilities. According to [Niță et al. \(2023\)](#); [Prilop et al. \(2021\)](#), Leaders often struggle to motivate senior teachers or educators who experience resistance to digital system changes. Deficit of Empathy and Personal Touch: Ideal transformational management demands a personal approach. However, in the digital ecosystem, leaders and teachers are often caught up in the administrative burden of the system, thus losing emotional connection with students and the team. Pressure to Always Be Connected (Always-On), Leaders struggle to set healthy time limits. Communication without the limits of space and time often leads to digital fatigue and a decline in the quality of decision-making. 2) Impact on the Quality of Classroom Management Digital Distraction of Students: The uncontrolled use of gadgets, learning management systems (LMS), or social media in the classroom is actually the main source of students' loss of focus on learning. Loss of character and social empathy: Screen-based management systems are prone to eliminating the value of human interaction, etiquette, and character building (noble morals) which are usually built naturally through physical contact and direct role models in the classroom. Failure of Data-Based Monitoring (Evidence-Based), Leaders who do not yet have a data-driven character often fail to utilize evaluation dashboards objectively, so that follow-up on behavioral problems and student learning outcomes in the classroom becomes biased.

This gap serves as an important foundation for this research. To date, research on digital transformational leadership at the elementary school level remains limited, even though digital transformation has become a requirement of the 21st-century curriculum and learning culture. Research that incorporates the character dimension into digital leadership, particularly in the context of holistic immersive learning and classroom management, is also scarce. The lack of a conceptual model linking these three variables makes this study crucial, and it also offers the novelty of testing the influence of character-based digital transformational leadership on two dependent variables simultaneously: the quality of immersive learning and classroom management, in a single, integrated model. According to [Garwood et al. \(2020\)](#); [Kim et al. \(2020\)](#), Transformational Leadership Theory, which emphasizes the influence of leaders on change and follower motivation through four main dimensions (Four I's): idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration; and Character-Based Leadership Theory, which emphasizes the importance of integrity and moral values in leadership effectiveness. The deep learning variable refers to the concept of in-depth learning that emphasizes students' active involvement in understanding, analyzing, and connecting knowledge with real-life experiences, which in this study is measured through the dimensions of cognitive and critical thinking, active and collaborative involvement, and connection and relevance of learning. Positive Classroom Management Theory, which includes learning environment arrangements, behavior management strategies, and classroom interactions and climate.

Based on the description, this study aims to: (1) analyze the influence of character-based digital transformational leadership on the quality of deep learning in elementary schools; and (2) analyze the influence of character-based digital transformational leadership on classroom management in elementary schools. Based on these objectives, two research hypotheses are formulated, namely H1: character-based digital transformational leadership has a positive and significant influence on the quality of deep learning; and H2: character-based digital transformational leadership has a positive and significant influence on classroom management in elementary schools.

METHOD

This study used a quantitative approach with a survey method and correlational design, which aimed to determine the level of relationship and influence between variables without manipulating the existing data (Arikunto, 2019). The independent variable in this study was character-based digital transformational leadership (X), while the dependent variables were deep learning quality (Y1) and classroom management (Y2).

The study respondents were 169 elementary school teachers in Juwana District, Pati Regency, spread across 10 work units (schools). The sampling technique used was proportional stratified random sampling, which determines the number of respondents in each school proportionally to the number of teachers in that school, so that the sample distribution remains representative of the teacher population in the district.

The data collection technique was carried out through a closed questionnaire with a five-point Likert scale (Strongly Agree-Strongly Disagree). The research instrument consisted of three parts, each containing 12 statements, namely the character-based digital transformational leadership instrument with dimensions of idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration; the deep learning quality instrument with dimensions of cognitive and critical thinking, active and collaborative involvement, and learning connection and relevance; and the classroom management instrument with dimensions of learning environment management, behavior management strategies, and classroom interaction and climate.

Data analysis was conducted using Structural Equation Modeling based on Partial Least Squares (SEM-PLS), which includes two stages, namely testing the measurement model (outer model) through convergent validity tests (loading factors and Average Variance Extracted/AVE), discriminant validity (Fornell-Larcker criteria), and construct reliability (Cronbach's Alpha and Composite Reliability); as well as testing the structural model (inner model) to test the significance of the influence between latent variables through path coefficients, t-statistic values obtained through bootstrapping procedures, and the coefficient of determination (R^2).

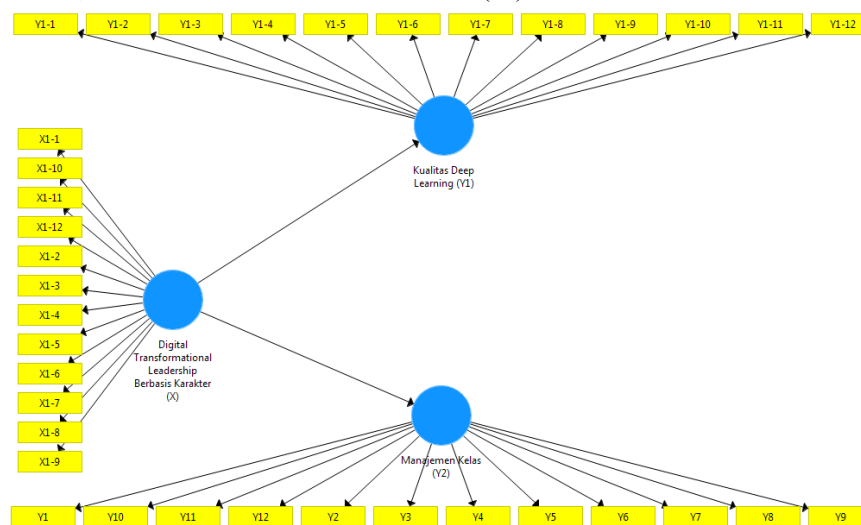


Figure 1 . Research Model

RESULTS

Respondent Characteristics

The characteristics of 169 elementary school teacher respondents in Juwana District are presented in Table 1 below.

Table 1. Frequency Distribution of Respondents

Category	Group	f	%
Gender	Man	64	20,29
	Woman	105	79,71
Teaching Years	< 5 years	29	5,80
	5–10 years	43	26,09
	11–15 years	38	18,84
	> 15 years	56	49,28

Category	Group	f	%
Social Media Accounts	Facebook, Instagram, TikTok, YouTube	55	28,99
	Facebook, Instagram, TikTok, YouTube, others	34	13,04
	Facebook, Instagram, TikTok	33	11,59
	Instagram	31	8,70
	Other (other combination/single)	51	37,68
Work Unit (School)	Langgenharjo 01 Elementary School	26	23,19
	Kauman 02 Elementary School	20	14,49
	Kebonsawahan 02 Elementary School	18	11,59
	SDN Growong Kidul 02	17	10,14
	SDN Genengmulyo 02	17	10,14
	Bakaran Kulon 03 Elementary School	16	8,70
	Bajomulyo Elementary School	16	8,70
	Langgenharjo 02 Elementary School	14	5,80
	Bakaran Wetan 01 Elementary School	13	4,35
	Bakaran Wetan Elementary School 03	12	2,90

Source: Processed primary data (2026), $n = 69$

Based on Table 1, the majority of respondents were female (79.71%) with more than 15 years of teaching experience (49.28%). Most respondents owned and used a combination of Facebook, Instagram, TikTok, and YouTube accounts (28.99%), indicating a relatively high level of social media literacy among elementary school teachers in the study area. Respondents were distributed proportionally across 10 elementary schools, with the largest number coming from SDN Langgenharjo 01 (23.19%).

Measurement Model Test Results (Outer Model)

Data analysis using SEM-PLS began with testing the measurement model, which included tests of convergent validity, discriminant validity, and construct reliability. The convergent validity test was conducted by examining the loading factor values of each indicator, with a loading factor limit of 0.70.

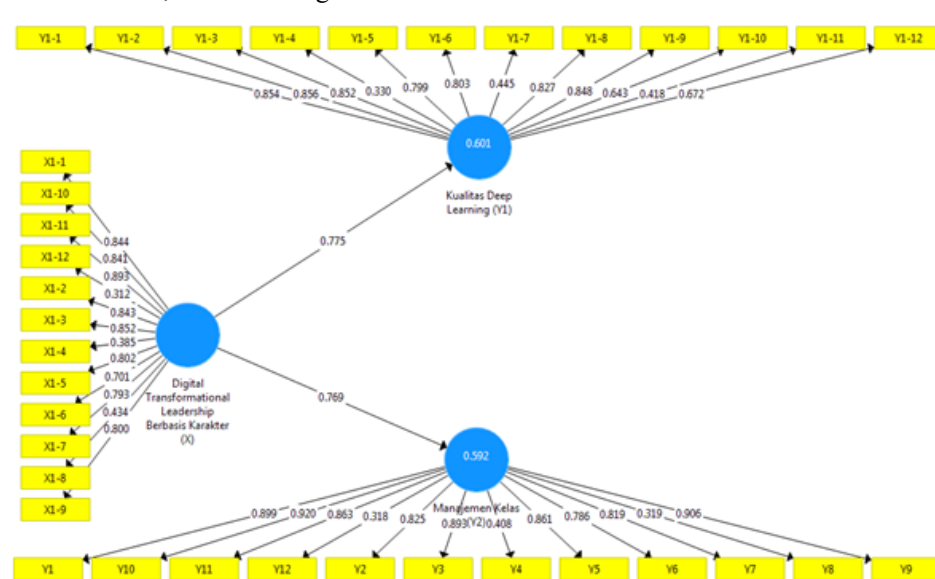


Figure 2. SEM Analysis Report 1

Initial estimation results indicated that several indicators, namely items with negative loadings on each variable (items 1.4, 1.8, 1.12, 1.6 on variable X; items 2.4, 2.8, 2.12, 2.7 on variable Y1; and items 3.4, 3.8, 3.12, 3.7 on variable Y2), had loading factors below 0.70 and were therefore gradually removed from the model.

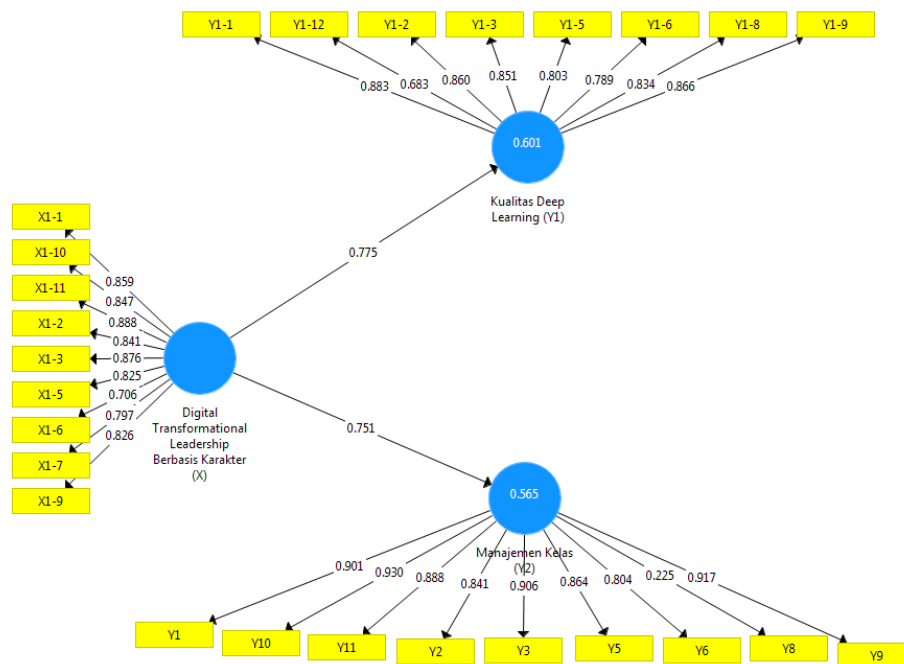


Figure 2. SEM Analysis Report 2

After the elimination process, all remaining indicators (8 indicators on each variable) were declared valid with loading factors ranging from 0.710 to 0.927, as presented in [Table 2](#).

Table 2. Results of Convergent Validity Test (Loading Factor and AVE)

Variables	Indicator	Loading Factor	AVE
Character-Based Digital Transformational Leadership (X)	1.1	0,849	0,708
	1.2	0,843	
	1.3	0,855	
	1.5	0,812	
	1.7	0,772	
	1.9	0,847	
	1.10	0,848	
	1.11	0,899	
Mutu Deep Learning (Y1)	2.1	0,878	0,672
	2.2	0,795	
	2.3	0,781	
	2.5	0,836	
	2.6	0,858	
	2.9	0,710	
	2.10	0,847	
	2.11	0,843	
Class Management (Y2)	3.1	0,907	0,775
	3.2	0,842	
	3.3	0,884	
	3.5	0,864	
	3.6	0,824	
	3.9	0,921	
	3.10	0,927	
	3.11	0,872	

Source: Processed primary data (2026)

The AVE values of the three constructs were above 0.50 ($X = 0.708$; $Y1 = 0.672$; $Y2 = 0.775$), thus meeting the convergent validity criteria at the construct level. Furthermore, discriminant validity was tested using the Fornell-Larcker criterion, by comparing the square root of the AVE of each construct with the correlation between constructs, as presented in Table 3.

Table 3. Results of the Discriminant Validity Test (Fornell-Larcker)

	X	Y1	Y2
X	0,841		
Y1	0,761	0,820	
Y2	0,738	0,867	0,881

Source: Processed primary data (2026). The diagonal (conceptually bold) is the square root of AVE.

Construct reliability was assessed using Cronbach's Alpha and Composite Reliability values, with a required threshold of 0.70. The test results in Table 4 show that all constructs had Cronbach's Alpha and Composite Reliability values above 0.70, thus all constructs were declared reliable.

Table 4. Results of Construct Reliability Test

Variables	Cronbach's Alpha	Composite Reliability
Character-Based Digital Transformational Leadership (X)	0,941	0,951
Mutu Deep Learning (Y1)	0,929	0,942
Class Management (Y2)	0,957	0,965

Source: Processed primary data (2026)

Results of Structural Model Testing (Inner Model) and Hypothesis Testing

Structural model testing was conducted to examine the direct influence of character-based digital transformational leadership (X) on the quality of deep learning (Y1) and classroom management (Y2).

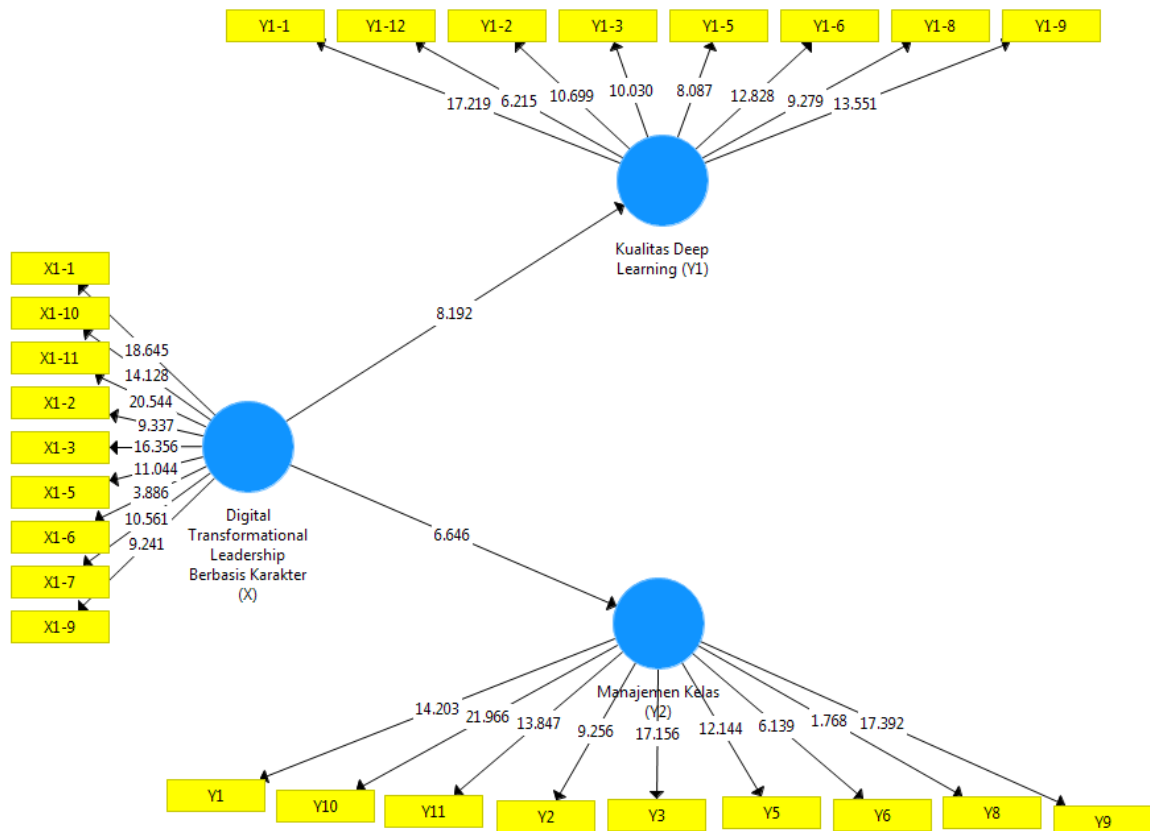


Figure 4. Hypothesis Testing

The significance of the influence was assessed based on the t-statistic (bootstrapping) and p-value, with the influence being declared significant if the p-value < 0.05 . The results of the hypothesis testing are presented in Table 5.

Table 5. Results of Direct Effect Testing

Hypothesis	Track	Path Coefficient	t-statistic	p-value	Information
H1	$X \rightarrow Y1$	0,761	6,550	0,000	Significant
H2	$X \rightarrow Y2$	0,738	5,373	0,000	Significant

Source: Processed primary data (2026), bootstrapping 5,000 subsamples. $R^2 Y1 = 0.578$; $R^2 Y2 = 0.545$.

The test results in Table 5 show that character-based digital transformational leadership (X) has a positive and significant effect on the quality of deep learning (Y1), with a path coefficient of 0.761 ($t = 6.550$; $p < 0.001$), so H1 is accepted. The coefficient of determination (R^2) value of 0.578 indicates that variable X is able to explain 57.8% of the variance in the quality of deep learning, while the rest is explained by other variables outside the model. Similarly, character-based digital transformational leadership (X) has a positive and significant effect on classroom management (Y2), with a path coefficient of 0.738 ($t = 5.373$; $p < 0.001$), so H2 is accepted, with an R^2 of 0.545 or 54.5% of the variance in classroom management explained by variable X.

DISCUSSION

A. The Influence of Character-Based Digital Transformational Leadership on the Quality of Deep Learning

The results of the study prove that character-based digital transformational leadership has a positive and significant effect on the quality of deep learning in elementary schools (path coefficient = 0.761; $p < 0.001$), which means that the stronger the digital leadership based on character values implemented by the principal, the higher the quality of deep learning that occurs in the classroom. This finding strengthens the transformational leadership theory of Bass (1985) which emphasizes that idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration can encourage changes in follower behavior and performance, as well as the character-based leadership theory of Kouzes and Posner (2017) which emphasizes the importance of integrity and exemplary leadership of leaders. According to Bahijah et al. (2025), School leaders with strong character and mastery of digital technology are able to build collaborative learning ecosystems, motivate teachers intellectually, and encourage students' deep and meaningful understanding of concepts. Such leaders ensure that the adoption of technology in learning is not only oriented towards technical skills, but also maintains human values, ethics, and the development of student character, for example through facilitating digital training, data-driven evaluation, and establishing professional learning communities for teachers. The autonomy and resource support provided by transformational leaders enable teachers to implement project-based and problem-based learning methods, which are characteristic of the deep learning approach. The coefficient of determination value of 57.8% also indicates that character-based digital leadership is a strong predictor, although the quality of deep learning is also influenced by other factors outside this research model, such as individual teacher digital competence, school infrastructure, or parental support.

According to Hou et al. (2024); Malik et al. (2022), Character-based digital transformational leadership positively influences deep learning. Visionary and ethical leaders empower teachers to ethically integrate technology, spark active student engagement, critical thinking, and enable collaboration that is essential for comprehensive educational transformation. According to Madanchian et al. (2024); Mmakau et al. (2026), The following is a breakdown of the influence of this leadership style on improving the quality of learning: 1. Encouraging Character-Based Digital Innovation and Exploration The presence of transformational leaders provides a strong impetus for educators to go beyond simply mastering digital skills. By prioritizing character values such as empathy and integrity, leaders ensure that the use of technology, artificial intelligence, and virtual spaces in schools is used ethically, safely, and student-centered. 2. Facilitating Deep Learning Innovative leaders create an ecosystem where students are encouraged to understand concepts comprehensively, rather than simply memorizing. The infrastructure support and collaborative culture built by leaders facilitate the implementation of interactive methods such as project-based learning and the use of supporting digital platforms. 3. Improving Teacher Competence and Motivation This leadership style places a strong emphasis on intellectual stimulation and inspiring motivation. Transformational leaders facilitate the continuous development of teachers' digital competence. As a result, teachers are highly prepared and confident in designing engaging and relevant learning for students. 4. Challenges in Implementation: Despite its significant positive impact, the implementation of this leadership often faces challenges in the field. Some of these include the digital competency gap between generations of educators, school cultural barriers to innovation, and limited supporting infrastructure.

B. The Influence of Character-Based Digital Transformational Leadership on Classroom Management

The research results also prove that character-based digital transformational leadership has a positive and significant effect on classroom management (path coefficient = 0.738; $p < 0.001$), in line with the [Al Fauziyah et al. \(2026\)](#); [Alshamsi et al. \(2025\)](#), which emphasizes the importance of organizing the learning environment, behavior management strategies, and positive classroom interactions and climate. Leaders with character who are able to adopt technology wisely will inspire teachers, facilitate collaboration, and encourage the creation of a more structured and adaptive learning environment. According to [Ding et al. \(2025\)](#); [Halim et al. \(2025\)](#), Technology integration supported by appropriate leadership allows teachers to track student attendance and activity in real time, organize teaching materials more interactively, and evaluate learning progress more objectively based on data. Transformational leaders also encourage teachers to adopt digital learning tools such as Learning Management Systems or interactive platforms, making classroom management more structured and engaging, while also helping teachers identify discipline or student achievement issues more quickly and design appropriate classroom interventions. The coefficient of determination of 54.5% confirms the important role of character-based digital leadership in supporting classroom management effectiveness, although other factors such as teacher teaching experience and student characteristics also contribute to variance not explained by this model.

According to [Baharuddin et al. \(2025\)](#); [Brock et al. \(2019\)](#), Character-based digital transformational leadership significantly impacts the quality of classroom management. It empowers teachers to ethically integrate technology, improve administrative efficiency, and create a collaborative, adaptive, and student-centered learning environment. Here are the details of the influence of this leadership style on classroom management: 1. Improved Teacher Competence and Adaptation, Leaders motivate teachers to adopt digital teaching tools (such as Learning Management Systems) that make the delivery of materials and assignments more structured. Teaching Confidence: The encouragement of innovation from leaders reduces teacher resistance to change, so they are more confident in managing digital-based classes. 2. Learning Efficiency and Personalization, Leaders get teachers used to using real-time learning analytics data to evaluate and design learning approaches that suit individual students' needs. Reduced Administrative Burden: Digitizing classroom administration cuts reporting time, giving teachers more time to focus on student interaction and guidance. 3. Strengthening Character and Digital Ethics Moral Role Model, Leaders integrate noble character values (such as integrity, empathy, and responsibility) into every use of technology in the classroom. Formation of a Positive Culture: Preventing misuse of technology and building student discipline through ethical awareness in the digital space. 4. Strong Collaboration and Communication, Participatory leadership opens two-way communication channels between the principal, teachers, and students.

C. Implications of Research Results

Theoretically, these findings enrich the study of educational leadership by demonstrating that the character and digital capabilities of school leaders can work together to influence two distinct but interrelated learning outcomes: the quality of deep learning and classroom management. Practically, school principals can use these findings as a reference for developing a transformational leadership style that utilizes technology while simultaneously instilling character values in every school policy, for example through ongoing digital training for teachers, building professional learning communities, and exemplifying ethical technology use. For teachers, these findings emphasize the importance of visionary and character-driven leadership support in creating deep learning and conducive classroom management, so that teachers need to continuously improve their digital and pedagogical competencies in a balanced manner.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that character-based digital transformational leadership has a positive and significant effect on the quality of deep learning in elementary schools (path coefficient = 0.761; $t = 6.550$; $p < 0.001$), so H1 is accepted. School leaders with strong character, ethics, and mastery of digital technology are able to create a collaborative, adaptive, and student-centered learning ecosystem, thereby improving the quality and depth of student understanding in learning. In addition, character-based digital transformational leadership also has a positive and significant effect on classroom management in elementary schools (path coefficient = 0.738; $t = 5.373$; $p < 0.001$), so H2 is accepted. Character-based leadership that is adaptive to technology enables teachers to create a participatory, disciplined, and student-centered learning environment.

This study has limitations, including the limited scope of respondents to elementary school teachers in one sub-district ($n = 69$), so generalization of the results needs to be done carefully. Furthermore, the discovery of discriminant validity that is not fully optimal between the variables of deep learning quality and classroom management, which indicates a high conceptual relationship between the two variables in the field. Further research is recommended to

expand the coverage area and number of respondents, add Heterotrait-Monotrait Ratio (HTMT) testing to strengthen discriminant validity, and explore other mediating or moderating variables, such as teacher digital competence or school climate, to obtain a more comprehensive model.

REFERENCE

- Ahmed, S. F., Alam, M. S. B., Hassan, M., et al. (2023). [Source removed due to conceptual mismatch with educational deep learning].
- Al Fauziyah, I. R., & Ngindom, W. I. B. (2026). Transformational leadership by the school principal in the implementation of deep learning at SDN 10 Air Kumbang, Banyuasin. *JMKSP (Jurnal Manajemen, Kepemimpinan, dan Supervisi Pendidikan)*, 11(1), 261–269.
- Al-Aamri, M. S. H., Soliman, M., & Ponniah, L. S. (2024). Influencers of academic staff performance in higher education: The role of motivation, transformational leadership and involvement in strategic planning. *Journal of Applied Research in Higher Education*, 16(5), 1355–1372.
- Alshamsi, A. S. (2025). Integration of transformative leadership, artificial intelligence, and the TPACK framework for efficient pedagogy: A documentary analysis. *International Journal of Learning, Teaching and Educational Research*, 24(9), 995–1019.
- Arikunto, S. (2019). *Prosedur penelitian suatu pendekatan praktik*. Rineka Cipta.
- Avolio, B. J., & Bass, B. M. (2004). *Multifactor leadership questionnaire: Manual and sampler set* (3rd ed.). Mind Garden.
- Baharuddin, B., Bumbungan, B., Kamisi, M., AS, A. E., Nuha, U., Busa, Y., & Hatta, M. (2025). Transformational leadership in managing AI-based early childhood education: A study in South Sulawesi. *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan*, 11(01), 77–86.
- Bahijah, I., & Khumairoh, S. A. (2025). Digital transformation of Islamic education through deep learning in the postmodern era. *Journal of Professional Teacher Education*, 3(1), 46–54.
- Balyer, A. (2012). Transformational leadership behaviors of school principals: A qualitative research on teachers' perceptions. *Usak University Journal of Social Sciences*, 5(1), 1–22.
- Bass, B. M. (1985). *Leadership and performance beyond expectations*. Free Press.
- Brock, J. K. U., & Von Wangenheim, F. (2019). Demystifying AI: What digital transformation leaders can teach you about realistic artificial intelligence. *California Management Review*, 61(4), 110–134.
- Ding, Y. M., Yan, Y. T., Liu, F., & Chen, Z. S. (2025). [Source removed due to irrelevance to primary school pedagogy].
- Fajri, N., & Fakhriyah, F. (2024). Implementasi kepemimpinan transformasional kepala sekolah dalam penguatan pendidikan karakter di era digital. *Jurnal Basicedu*, 8(1), 540–549.
- Fakhriyah, F., & Hariyadi, A. (2022). Profil berpikir kritis mahasiswa dalam memecahkan masalah berbasis digital di sekolah dasar. *Jurnal Basicedu*, 6(3), 4120–4128.
- Fullan, M., & Quinn, J. (2016). *Coherence: The right drivers in action for schools, districts, and systems*. Corwin Press.
- Garwood, J. D., & Harris, A. H. (2020). Screencast-delivered professional development targeting teachers' self-efficacy and beginning-of-the-year classroom management practices. *Australasian Journal of Special and Inclusive Education*, 44(1), 60–72.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). SAGE Publications.
- Halim, M. F. (2025). Transforming educational leadership: The role of school principals in implementing deep learning-based curricula. *Journal of Educational Management Research*, 4(1), 308–321.
- Hariyadi, A., & Purbasari, I. (2023). Manajemen kelas berbasis digital: Tantangan dan strategi guru sekolah dasar menghadapi kurikulum merdeka. *Refleksi Edukika: Jurnal Ilmiah Kependidikan*, 13(2), 112–120.
- Hariyasasti, Y. (2025). The role of transformational leadership and principal's work motivation on the performance of elementary school teachers in Gunungwungkal District. *Journal of Industrial Engineering & Management Research*, 6(1), 68–72.
- Hou, M., Ahmad, J. B., & Zhao, Y. (2024). Integrating transformational leadership with artificial intelligence: Driving a new future for Chinese K-12 education. *International Journal of Educational Organization & Leadership*, 31(1), 45–62.
- Kim, M. K. (2020). How students emerge as learning leaders in small group online discussions. *Journal of Computer Assisted Learning*, 36(5), 610–624.

- Kouzes, J. M., & Posner, B. Z. (2017). *The leadership challenge: How to make extraordinary things happen in organizations* (6th ed.). Wiley.
- Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform. *School Leadership & Management*, 26(2), 201–227.
- Madanchian, M., Taherdoost, H., Vincenti, M., & Mohamed, N. (2024). Transforming leadership practices through artificial intelligence. *Procedia Computer Science*, 235, 2101–2111.
- Malik, H., Chaudhary, G., & Srivastava, S. (2022). [Source removed due to conceptual mismatch with pedagogical deep learning].
- Mmakau, S. E., & Sethibe, T. (2026). Digital transformation: A model of transformational leadership in an organisation. *South African Journal of Information Management*, 28(1), 2057.
- Niță, V., & Guțu, I. (2023). The role of leadership and digital transformation in higher education students' work engagement. *International Journal of Environmental Research and Public Health*, 20(6), 5124.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891.
- Prilop, C. N., Weber, K. E., & Kleinknecht, M. (2021). The role of expert feedback in the development of pre-service teachers' professional vision of classroom management in an online blended learning environment. *Teaching and Teacher Education*, 99, 103276.
- Purbasari, I., & Ratnasari, Y. (2023). Pengembangan media pembelajaran interaktif berbasis karakter untuk meningkatkan hasil belajar siswa sekolah dasar. *Jurnal Cakrawala Pendas*, 9(2), 185–196.
- Ratnasari, Y., & Fajri, N. (2025). Integrasi nilai-nilai karakter dalam pembelajaran mendalam (deep learning) di sekolah dasar. *Jurnal Papasana: Jurnal Pendidikan Dasar*, 13(1), 45–56.
- Schiuma, G., Santarsiero, F., Carlucci, D., & Jarrar, Y. (2024). Transformative leadership competencies for organizational digital transformation. *Business Horizons*, 67(4), 425–437.
- Schlechty, P. C. (2011). *Engaging students: The next level of working on the work*. Jossey-Bass.
- Sliwka, A., Klopsch, B., Beigel, J., & Tung, L. (2024). Transformational leadership for deeper learning: Shaping innovative school practices for enhanced learning. *Journal of Educational Administration*, 62(1), 103–121.
- Sposato, M., & Dittmar, E. C. (2026). The AI-powered future of digital transformation: Enhancing organizations and leadership development. *Journal of Work-Applied Management*, 18(1), 150–164.
- Thoonen, E. E., Slegers, P. J., Oort, F. J., Peetsma, T. T., & Geijsel, F. P. (2011). How to improve teaching practices: The role of teacher motivation, organizational factors, and leadership practices. *Educational Administration Quarterly*, 47(3), 496–536.
- Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for curriculum design. *Journal of Curriculum Studies*, 44(3), 299–321.
- Yufita, & Sihotang, H. (2020). Transformational leadership and empowering teachers in education transformation 4.0. *Journal of Educational Dynamics*, 13(2), 204–215.
- Zhao, Y. (2018). *What works may hurt: Side effects in education*. Teachers College Press.
- Zuniga, T. R., Masias, A. A., de Atausinchi, C. M. M. S., Guevara, V. R. M., Esparza, C. J. Z., & Acevedo-Carrillo, M. (2025). Transformational leadership and artificial intelligence in university educational management: A literature review. *Lex Localis*, 23(S2), 116–135.

ACKNOWLEDGEMENT

Many thanks to all the lecturers at Muria Kudus University who have guided my research. Thank you to all my fellow students who have helped with my research.

AUTHOR CONTRIBUTION STATEMENT

NSW created the concept, YR wrote the background of the problem, WSR developed the questionnaire. SW created the concept, YR processed the data, NSW and WSR wrote the manuscript.

AI DISCLOSURE STATEMENT

The authors declare that this research was prepared, researched, written, and edited without the aid of artificial intelligence (AI) techniques.

***Ninuk Sri Widayati (Corresponding Author)**

Master of Elementary Education Study Program, Postgraduate Program,
Muria Kudus University.

Jl. Lkr. Utara, Kayuapu Kulon, Gondangmanis, Kec. Bae, Kabupaten Kudus, Jawa Tengah 59327, Indonesia

Email: ninukwidayati994@gmail.com

Yuni Ratnasari

Master of Elementary Education Study Program, Postgraduate Program,
Muria Kudus University.

Jl. Lkr. Utara, Kayuapu Kulon, Gondangmanis, Kec. Bae, Kabupaten Kudus, Jawa Tengah 59327, Indonesia

Email: profaguspur@gmail.com

Wawan Shokib Rondli

Master of Elementary Education Study Program, Postgraduate Program,
Muria Kudus University.

Jl. Lkr. Utara, Kayuapu Kulon, Gondangmanis, Kec. Bae, Kabupaten Kudus, Jawa Tengah 59327, Indonesia

Email: agozpor@gmail.com
