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Principals' digital leadership on teacher performance and student competence in 21st-century education

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Abstract

Principal leadership has become increasingly important as schools respond to digital transformation and the demands of 21st-century learning. How principals guide the use of technology may be associated with the quality of teachers' professional practice and the development of students' competencies. This study examined the relationships among principals' digital leadership, teacher performance, and student competencies and assessed the mediating role of teacher performance in senior high schools in Southwest Sumba. A quantitative ex post facto design was employed, involving 30 teachers selected through proportional random sampling. Data were collected using a five-point Likert-scale questionnaire and analyzed using reflective SEM-PLS. The results showed that principals' digital leadership was positively associated with both teacher performance and student competencies. Teacher performance was also positively associated with student competencies and significantly mediated the relationship between digital leadership and student competencies. These findings suggest that digital transformation in schools depends not only on principals' capacity to provide technological direction but also on teachers' ability to translate that direction into effective professional and instructional practices. Strengthening digital leadership should thus be accompanied by sustained teacher professional development and support for instructional innovation to create learning environments that foster students' competencies.

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1. Introduction

21st-century education requires schools to build students' abilities to think critically, communicate, collaborate, be creative, and use technology appropriately. Schools need to adjust how they manage learning and develop teachers' capacities to be more responsive to technological advancements and students' learning needs (Timan & Imron, 2022). These conditions place school principals in a strategic position to guide school transformation, support teachers, foster digital capacity-building, and cultivate a culture of innovation, all of which are heavily influenced by the quality of their leadership. Rapid technological advancements and changes in the educational environment underscore the need for a leadership style that can respond to change adaptively (Kurniawan et al., 2025).

One relevant approach is digital leadership. Digital leadership reflects a leader's ability to integrate technology with organizational management, communication, human resource development, and the improvement of learning quality (Kandari & Qattan, 2020; Esplin et al., 2018). Technology can enhance organizational work effectiveness and communication, but these benefits depend on how leaders direct and

integrate it with organizational goals (Henderi et al., 2008). Digital leadership is reflected in a principal's ability to develop a digital vision, manage change, foster learning innovation, and create conditions that support the development of teachers' competencies (Halverson & Grigg, 2010; Couros, 2015). This approach is crucial because integrating technology into education requires leaders who are responsive to changes in the school environment (Tobari et al., 2018; Winanda & Nuraini, 2019). However, digital leadership does not automatically lead to changes in students' learning experiences. Teachers must translate the principal's direction and support into instructional practices. Teacher performance encompasses a teacher's ability to plan, implement, evaluate, and professionally develop instruction (Supardi, 2016; Nurabadi et al., 2021). Teachers need to integrate technology with pedagogical strategies that foster student engagement, problem-solving, communication, and collaboration (Al Kandari et al., 2020). Several studies indicate that teacher leadership and capacity are related to the quality of educational practices. Leadership that empowers human resources can enhance organizational performance quality (Amrullah et al., 2022), while principals' digital leadership has been reported to be positively associated with teacher performance (Yulia Rahmawati, 2023). Sheninger's (2014) findings also indicate that digital leadership can drive learning innovation through technology. Furthermore, Boholano (2017) identifies technological literacy and utilization as essential components of 21st-century educational readiness.

The quality of these teaching practices aligns with the development of student competence. Twenty-first-century student competencies include the ability to apply knowledge in real-world situations, think critically, communicate, collaborate, generate ideas, and adapt to change (Trilling & Fadel, 2009; Aprillionita et al., 2024). Critical thinking requires the ability to evaluate information and make decisions reflectively and rationally (Ennis, 2011). Problem-solving, on the other hand, requires a systematic process to find solutions to the problems at hand (Polya, 1973). Communication, creativity, and collaboration complement these skills by enabling the conveyance of ideas, the generation of new possibilities, and productive collaboration with others (DeVito, 2016; Torrance, 1974; Johnson & Johnson, 1999). Therefore, the development of student competencies is closely tied to the quality of learning and teachers' capacity to utilize technology. Unfortunately, this poses a complex challenge in areas with limited resources and digital infrastructure. In Southwest Sumba Regency, East Nusa Tenggara Province, secondary schools still face challenges in developing students' competencies, particularly in critical thinking.

Meanwhile, lecture-oriented teaching practices can limit students' opportunities to analyze information and solve problems. Muhammad Syahril et al. (2021) demonstrated a correlation between the predominance of lecture-based methods, the limited use of problem-based learning, and students' low critical thinking skills. Limited technological infrastructure is also an issue, as it can restrict students' opportunities to develop digital literacy and technology-based communication skills (Siti Nurhayati et al., 2022). On the other hand, collaborative learning can enhance communication, cooperation, and student participation (Dewi Sartika, 2020), while teachers' pedagogical and digital competencies are linked to student competencies (Susanto, 2021). These conditions indicate that the issue of student competencies requires leadership and teaching practices that optimize the use of technology.

Although previous research has provided evidence regarding the relationship between digital leadership and teacher performance, as well as the importance of teachers' capacity in supporting student competence, the relationship among these three constructs has not yet been fully understood within a single empirical framework, particularly in the context of secondary schools in Southwest Sumba Regency. Some studies have emphasized the direct relationship between leadership and performance, while the mechanisms linking digital leadership to student competence through teacher performance remain underexplored. In fact, school principals are more closely involved in shaping working conditions, professional development directions, and school culture. Meanwhile, teachers are the actors who translate these conditions into instructional practices. This perspective provides a basis for viewing teacher performance as an outcome of digital leadership and as a potential mechanism bridging the relationship between leadership and student competence. This study aims to analyze the relationships among principals' digital leadership, teacher performance, and student competence in 21st-century education in high schools in Southwest Sumba Regency. The study also examines the role of teacher performance as a mediator, as illustrated in Figure 1. The research findings can serve as a basis for schools in designing leadership development programs, teacher capacity-building initiatives, and learning strategies that are better adapted to the demands of 21st-century education, particularly in areas with limited resources and digital infrastructure.

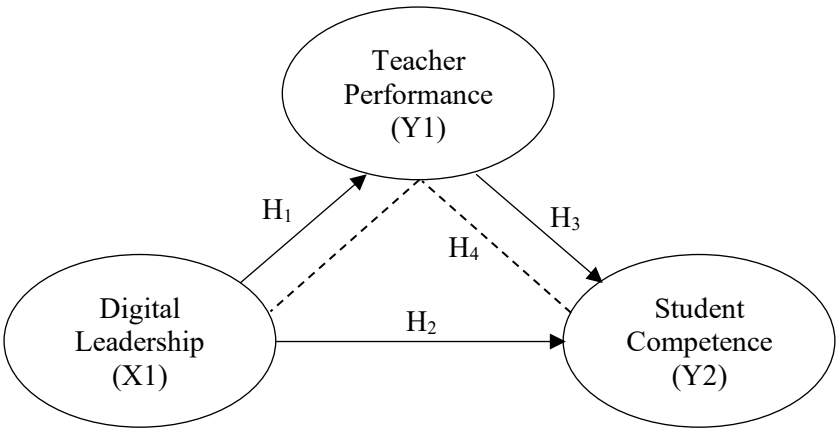


Figure 1. Constellation of research variables

2. Method

2.1. Research Approach and Participants

This study employed a quantitative, ex post facto design. This design was used to examine relationships among variables based on existing conditions, without applying treatments or conducting experimental manipulations on respondents (Maidiana, 2021; Waruwu, 2023). The study was conducted at a high school in Southwest Sumba Regency, East Nusa Tenggara Province. The study sample consisted of 30 teachers. The sample size was determined using the inverse square root and gamma exponential methods, with a statistical power of 80%, a minimum path coefficient of 0.41-0.50, and a significance level of 5% (Subhaktiyasa, 2024b). Subsequently, respondents were selected through proportional random sampling. This technique was used to provide equal opportunity for members of the population to be selected and to maintain the proportional representation of respondents in the sampling process (Firmansyah & Dede, 2022; Subhaktiyasa, 2024a).

2.2 Instruments and Data Collection

Research data were collected using a closed-ended questionnaire designed to measure three constructs: digital leadership (X1), teacher performance (Y1), and student competence (Y2). The questionnaire was administered online through Google Forms. Digital leadership was operationalized across five dimensions: visionary leadership, digital-age learning culture, excellence in professional practice, systemic improvement, and digital citizenship. Teacher performance was measured across three dimensions: learning planning, learning implementation, and student relationships. Student competence comprised six dimensions: faith, piety, and noble character; global diversity; mutual cooperation; independence; critical thinking; and creativity. Student competence was assessed from teachers' perceptions of students' competencies across these six dimensions rather than through direct student assessment.

Table 1. Instrument dimensions and number of items

Variable	Dimension	Number of Items	Total Items
Digital Leadership	Visionary leadership	5	25
	Digital-age learning culture	5	
	Excellence in professional practice	5	
	Systemic improvement	5	
	Digital citizenship	5	
Teacher Performance	Planning learning	12	33
	Implementing learning	14	
	Relationships with students	7	
Student Competence	Faith, piety, and noble morals	6	36
	Global diversity	6	
	Mutual cooperation	6	
	Independence	6	
	Critical thinking	6	
	Creativity	6	

The instrument development process was conducted systematically, beginning with the identification of relevant dimensions and indicators for each construct based on a review of the theoretical literature. An instrument blueprint was then prepared to specify the dimensions, indicators, and number of items representing each construct. All items were measured using a five-point Likert scale ranging from "strongly disagree" to "strongly agree." Before data collection, the instrument underwent theoretical validation through expert judgment involving two experts. This process was intended to assess the conceptual alignment and consistency among the constructs, dimensions, indicators, and individual questionnaire items. The final instrument comprised 94 items: 25 measuring digital leadership, 33 measuring teacher performance, and 36 measuring student competence. The distribution of items across the dimensions of each construct is presented in Table 1. A closed-ended questionnaire with predetermined response categories was employed in accordance with the characteristics of quantitative survey research (Agung, 2020).

2.3 Data Analysis

Data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with a reflective measurement model in SmartPLS 3 (Arya Pering, 2020). The analytical procedure followed two main stages: evaluation of the measurement model (outer model) and assessment of the structural model (inner model) (Subhaktiyasa, 2024b). The outer model was assessed to establish the reliability and validity of the constructs. Indicator reliability was assessed using outer loadings; values of 0.70 or higher are generally considered acceptable. Internal consistency reliability was assessed using Cronbach's Alpha, with coefficients above 0.70 indicating satisfactory reliability. Convergent validity was evaluated using the Average Variance Extracted (AVE), for which values greater than 0.50 were considered adequate. Discriminant validity, in turn, was examined using the Fornell–Larcker criterion to determine whether each construct was sufficiently distinct from the others. Assessment of the inner model focused on the extent to which the structural model explained the relationships among the latent constructs. The coefficient of determination (R^2) was used to determine the proportion of variance in endogenous constructs explained by the exogenous constructs included in the model. As general benchmarks, R^2 values of 0.75, 0.50, and 0.25 were interpreted as indicating strong, moderate, and weak explanatory power, respectively. The hypothesized relationships were then assessed using path coefficients, which provide information about the direction and magnitude of the relationships between constructs. Statistical significance was evaluated through nonparametric bootstrapping with 5,000 subsamples. A hypothesis was considered supported when the corresponding p-value was below 0.05.

2.4 Ethical Considerations

The study involved teachers as respondents and was conducted in accordance with established research ethics principles. Before completing the questionnaire, respondents received clear information about the study's purpose, the data collection procedures, the voluntary nature of their participation, and how their information would be used. These details were presented through Google Forms before respondents were asked to provide their consent. Informed consent was obtained electronically through the respondents' agreement in the designated consent section of the online questionnaire. Participation was entirely voluntary, and respondents were not required to disclose information that could compromise their privacy. Throughout the research process, the confidentiality of respondents' identities was carefully maintained, and the data collected were used exclusively for research purposes.

3. Results and Discussion

3.1 Results

The data analysis provides an overview of the distribution of scores and the observed characteristics of the variables included in the research model. Descriptive statistics were used to summarize the scores for digital leadership, teacher performance, and student competence. For each construct, the analysis reports the number of respondents, mean, median, standard deviation, and minimum and maximum values. These statistics provide a preliminary description of the data before examining the relationships among the constructs. The results are presented in Table 2.

Table 2. Descriptive Statistics of the Research Variables

Variable	N	Mean	Median	Std. Deviation	Minimum	Maximum
Digital Leadership	30	112.07	115.00	7.930	96	121
Teacher Performance	30	147.87	146.00	11.184	128	165
Student Competence	30	159.40	159.00	8.050	147	178

Table 2 presents a mean digital leadership score of 112.07 with a standard deviation of 7.930, and the minimum and maximum scores were 96 and 121, respectively. Teacher performance had a mean of 147.87, a standard deviation of 11.184, a minimum of 128, and a maximum of 165. Meanwhile, student competence had a mean score of 159.40, a standard deviation of 8.050, a minimum of 147, and a maximum of 178. Next, the measurement model was evaluated to assess the quality of the indicators in representing the research construct. Convergent validity was evaluated by examining item loadings for each indicator relative to the construct being measured (see Table 3).

Table 3. Outer loading values for indicators

The Relationship Between Indicators and Constructs	Outer Loading
X1 ← Digital Leadership	0.779
X2 ← Digital Leadership	0.626
X3 ← Digital Leadership	0.715
X4 ← Digital Leadership	0.785
X5 ← Digital Leadership	0.741
Y1.1 ← Teacher Performance	0.718
Y1.2 ← Teacher Performance	0.775
Y1.3 ← Teacher Performance	0.944
Y2.1 ← Student Competence	0.758
Y2.2 ← Student Competence	0.771
Y2.3 ← Student Competence	0.705
Y2.4 ← Student Competence	0.797
Y2.5 ← Student Competence	0.761
Y2.6 ← Student Competence	0.812

Table 3 shows that most indicators have outer loading values exceeding the recommended threshold of 0.70. Indicator X2 records a loading of 0.626, whereas the remaining indicators range from 0.705 to 0.944. Despite the relatively lower loading of X2, all indicators were retained in the measurement model for subsequent analysis. Discriminant validity was then assessed using the Fornell–Larcker criterion, with the results presented in Table 4.

Table 4. Fornell–Larcker criteria

Construct	Digital Leadership	Teacher Performance	Student Competence
Digital Leadership	0.718		
Teacher Performance	0.192	0.805	
Student Competence	0.320	0.567	0.642

As shown in Table 4, the correlations among the constructs range from 0.192 to 0.567. The diagonal values used in the Fornell–Larcker assessment are 0.718 for digital leadership, 0.805 for teacher performance, and 0.642 for student competence. These values were examined in relation to the correlations among the constructs to assess the distinctiveness of each latent variable. Construct reliability was subsequently evaluated, and the corresponding results are presented in Table 5.

Table 5. Construct reliability and average variance extracted

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Digital Leadership	0.906	0.844	0.863	0.683
Teacher Performance	0.833	0.881	0.867	0.797
Student Competence	0.832	0.823	0.878	0.693

Table 5 shows that the Cronbach's Alpha coefficients for all constructs exceed the 0.70 threshold. Composite Reliability and Average Variance Extracted (AVE) also meet the minimum criteria established for the analysis. Taken together, these results indicate that all three constructs demonstrate satisfactory internal consistency and convergent validity. With the measurement model meeting the required criteria, the analysis proceeded to the structural model to assess how well the exogenous constructs account for variance in the endogenous constructs. The coefficient of determination (R^2) was examined for each endogenous construct. Teacher performance yielded an R^2 of 0.537 and an adjusted R^2 of 0.503, indicating that the predictor constructs in the model account for 53.7% of the variance in teacher performance. For student competence, the R^2 was 0.712, and the adjusted R^2 was 0.676, suggesting that the predictor constructs in the model explain 71.2% of the variance in student competence. These values indicate the model's explanatory capacity for the endogenous constructs. Hypothesis testing was subsequently performed using path coefficients and a bootstrapping procedure with 5,000 subsamples. The results of the direct and indirect relationship tests are presented in Table 6.

Table 6. Results of tests for direct and indirect relationships

	Path Coefficient	SD	T-Statistic	p-value	Decision
Digital Leadership → Teacher Performance	0.292	0.135	2.156	0.032	Supported
Digital Leadership → Student Competence	0.320	0.114	2.771	0.026	Supported
Teacher Performance → Student Competence	0.653	0.121	5.396	0.001	Supported
Digital Leadership → Teacher Performance → Student Competence	0.325	0.115	2.826	0.023	Supported

Table 6 presents the results of the direct and indirect effect analyses. Digital leadership has a positive and statistically significant relationship with teacher performance, as indicated by a path coefficient of 0.292, a t-statistic of 2.156, and a p-value of 0.032. A similarly positive relationship was observed between digital leadership and student competence, with a path coefficient of 0.320, a t-statistic of 2.771, and a p-value of 0.026. Teacher performance, in turn, shows a stronger positive relationship with student competence ($\beta = 0.653$, $t = 5.396$, $p < 0.001$). All three direct paths are statistically significant at the 5% level. The analysis also identifies a significant indirect effect of digital leadership on student competence through teacher performance, with a coefficient of 0.325, a t-statistic of 2.826, and a p-value of 0.023. This finding suggests that teacher performance serves as a significant mediating pathway through which digital leadership is associated with student competence.

3.2 Discussion

Digital Leadership and Teacher Performance

The findings indicate that digital leadership is positively and significantly associated with teacher performance. This relationship suggests that the way principals guide and support technology use is connected to the conditions under which teachers carry out their professional responsibilities. In practice, digital leadership may be reflected in a principal's capacity to articulate a clear digital vision, foster a technology-oriented learning culture, support teachers' professional practices, promote systematic improvement, and strengthen awareness of responsible digital citizenship. Such leadership becomes increasingly relevant as schools operate in environments where digital technologies are embedded in communication, instructional planning, resource management, and everyday teaching activities. Northouse (2016) emphasizes that effective leadership requires leaders to respond appropriately to changes in their organizational environment. In a progressively digitized educational setting, this adaptability is particularly important because principals must not only manage existing resources but also guide teachers through changing approaches to work, communication, and learning. Prasojo (2018) similarly conceptualizes digital leadership as the capacity of educational leaders to employ information technology to improve school management, organizational communication, academic supervision, and the quality of learning. From this perspective, digital leadership is not simply about introducing technological tools; it is about creating organizational conditions in which technology can be used purposefully to support professional practice.

The observed relationship between digital leadership and teacher performance is also consistent with findings from previous studies. Olowo (2026), for example, reported that principals' supervisory skills were significantly associated with teachers' job performance and instructional delivery in secondary schools. Although supervisory skills and digital leadership represent distinct leadership dimensions, the finding underscores the broader importance of principals' leadership practices in shaping teachers' professional work. Swandewi et al. (2024) likewise found positive associations among instructional leadership, digital literacy, and teacher performance, suggesting that leadership and digital capability can work together to create a professional environment that supports more effective teaching practices. A similar pattern was reported by Sutono et al. (2025), who found significant associations between transformational leadership, digital competence, and teacher performance, with work motivation functioning as a mediating factor. Taken together, these studies point to a broader interpretation: teachers' performance is shaped not only by their individual competencies but also by the leadership and organizational conditions in which those competencies are exercised.

The principal's role can consequently be viewed as central to the development of the school's digital ecosystem. Digital leadership involves more than encouraging teachers to use technology; it also includes providing direction, facilitating access to appropriate digital resources, strengthening technology-mediated communication, and creating an organizational climate in which teachers feel supported as they adapt their instructional practices. For instance, principals may encourage teachers to use digital learning platforms for lesson delivery and assessment, facilitate professional development on emerging educational technologies, or establish channels for sharing effective technology-based teaching practices. These forms of support can make digital technology a more integrated part of teachers' daily professional work rather than an additional task imposed from outside the instructional process. In this sense, the positive association observed in the present study may reflect the extent to which effective digital leadership contributes to a work environment that enables teachers to adapt, experiment, and refine their teaching practices.

Digital Leadership and Student Competence

The findings reveal a positive and statistically significant relationship between digital leadership and student competence. This result addresses the research objective of examining the relationship between school principals' leadership and the development of student competencies within the context of 21st-century learning. Importantly, the finding should be interpreted as an association between digital leadership and teachers' perceptions of student competence rather than as direct evidence that leadership alone produces changes in students' abilities. Sheninger (2014) describes digital leadership as the capacity of educational leaders to use technology strategically to strengthen communication, encourage innovation in teaching and learning, enhance school productivity, and promote the development of 21st-century skills. From this perspective, principals contribute to the institutional conditions that allow technology to be integrated more purposefully into educational practice. The relationship between digital leadership and student competence may consequently be understood through the learning environments and instructional practices that school leaders help establish and facilitate.

Such an interpretation is consistent with the framework proposed by Trilling and Fadel (2009), who identify critical thinking, creativity, communication, collaboration, digital literacy, problem-solving, and adaptability as important dimensions of 21st-century learning. When principals cultivate a school culture that encourages appropriate technology use and instructional innovation, teachers may have greater opportunities to design learning experiences in which students actively engage, collaborate, solve problems, and meaningfully apply digital resources. Evidence from Al Ajmi (2022) further supports this perspective, showing that principals' digital leadership is significantly associated with the development of 21st-century skills through the integration of technology into teaching and the cultivation of an innovative school culture.

The present finding is also supported by Hidayat and Khotimah (2023), who reported a positive relationship between principals' digital leadership, the implementation of 21st-century learning, and the development of student competencies at the high school level. Taken together, these findings suggest that digital leadership represents an important organizational condition for supporting changes in instructional practice. The effective use of technology in learning is not simply a matter of providing digital tools; it also depends, at least in part, on school leaders' capacity to provide direction, encourage innovation, and create conditions that enable teachers to integrate technology into meaningful educational experiences.

Teacher Performance and Student Competence

The positive and statistically significant relationship between teacher performance and student competence suggests that the quality of teachers' professional practice is closely associated with how teachers perceive their students' competence. This relationship also highlights the teacher's position as an important link between school-level policies, leadership support, available resources, and students' day-to-day learning experiences. What teachers do in the classroom matters because instructional planning, classroom interaction, assessment, and feedback collectively shape the conditions in which students develop their knowledge, skills, and dispositions. Supardi (2014) emphasizes that teacher performance is a key determinant of the quality of the educational process, particularly because teachers have a strategic role in developing students' academic abilities, character, and practical skills. From this perspective, teacher performance is reflected not merely in the completion of professional duties but also in the quality of learning experiences that teachers design, implement, monitor, and adapt in response to students' needs.

The connection becomes particularly relevant in learning environments where technology and 21st-century competencies are increasingly intertwined. Mishra and Koehler (2006) argue that technology cannot be treated as an independent component of instruction; its educational value depends on how technological knowledge is integrated with pedagogical knowledge and subject matter. Teachers who can select appropriate digital tools, align them with learning objectives, employ effective instructional strategies, and maintain active student engagement are more likely to create learning experiences that support the development of diverse competencies. Ngaini et al. (2024) provide empirical support for this perspective, showing that teachers' capacity to implement 21st-century learning is associated with students' proficiency in collaborative and contextual learning as well as the development of their social skills. Similarly, Ishmatullah et al. (2023) identify teacher professionalism, innovation, and adaptability to technology as important characteristics of 21st-century teachers and relate these qualities to students' capacity to respond to the demands of contemporary learning.

The evidence suggests that the relationship between teacher performance and student competence is closely connected to the quality of the learning experiences teachers create. Effective teacher performance provides students with opportunities to think critically, exercise creativity, work independently, collaborate with others, and develop appropriate social and character-related dispositions. These competencies do not emerge solely from exposure to curriculum content; they are also shaped by the ways teachers structure classroom activities, facilitate interaction, use learning resources, and respond to students' progress. Within the present research model, teacher performance is consequently relevant to several dimensions of student competence, including thinking skills, creativity, independence, collaboration, and character, as perceived by teachers. The finding reinforces the importance of understanding teacher performance as a multidimensional professional practice that extends beyond instructional delivery and contributes to the quality of students' learning experiences and competency development.

Digital Leadership, Teacher Performance, and Student Competence

The findings indicate that the relationship between digital leadership and student competence operates through teacher performance, offering a more integrated explanation than examining direct relationships alone. School principals occupy a strategic position in establishing the school's digital direction and shaping its organizational culture, yet the implications of that leadership for students' learning experiences are largely realized through teachers' professional practices. The observed pattern can thus be understood as an interconnection between leadership, professional practice, and the learning process. When principals provide clear direction on technology use, support teachers' development of digital competencies, and cultivate a school culture receptive to innovation, teachers may be better positioned to adapt their instructional practices and create meaningful learning experiences. Northouse's (2016) perspective emphasizes the importance of leadership adaptability in responding to changes in the organizational environment, while Prasojo (2018) highlights the role of technology in educational leadership, particularly in strengthening school management, communication, supervision, and learning quality. Together, these perspectives help explain how leadership-level changes may be translated into organizational practices that shape teachers' work.

Previous research provides further support for this interpretation. Dewvy Nur Anisa and Dian Hidayati (2024) found that the implementation of digital leadership by school principals can support the development of students' 21st-century skills, particularly life and career skills. Their findings also emphasize the principal's role in cultivating a digital culture through collaboration among teachers,

students, and parents. Such collaboration suggests that digital leadership is not confined to administrative decisions or technology provision; it can influence the broader organizational conditions in which teaching and learning take place. Solehan and Lazwardi (2025) similarly found that principals' digital learning leadership plays an important role in supporting the transformation of 21st-century learning. Viewed alongside the present findings, this evidence suggests that the relationship between digital leadership and student competence is better understood within a broader organizational and pedagogical framework in which teacher performance serves as an important connecting pathway.

The principal's leadership and teachers' professional performance should consequently not be viewed as isolated elements. They form interconnected conditions that influence how digital transformation is experienced in everyday teaching and learning. For principals, this means that digital transformation requires more than establishing a technological vision; it calls for sustained support, teacher capacity building, appropriate monitoring, and opportunities for teachers to refine their practices as technologies and instructional demands evolve. For teachers, a supportive digital leadership environment can provide greater opportunities to design learning activities that are active, collaborative, creative, and responsive to students' needs. Capacity building is thus an essential part of digital transformation because the availability of technology alone does not guarantee better educational outcomes. Its educational value depends substantially on how principals guide its adoption and how teachers integrate digital resources with appropriate pedagogical strategies. The mediating role of teacher performance observed in the present study therefore reinforces the importance of developing digital leadership alongside continuous teacher professional development. Organizational changes initiated at the leadership level are more likely to become meaningful for students when they are translated into teachers' daily instructional practices and, ultimately, into richer learning experiences.

4. Conclusion

Principals' digital leadership has a positive and significant relationship with teacher performance and perceptions of student competencies in high schools in Southwest Sumba Regency. The research findings indicate that digital leadership is reflected in principals' ability to foster a culture of digital learning, support professional practices, promote systemic improvement, and cultivate responsible digital engagement. Teacher performance also shows a positive and significant relationship with perceived student competencies. This suggests that the quality of teachers' planning, instructional delivery, and interactions with students is a key factor in shaping perceived student competencies, including critical thinking, creativity, independence, collaboration, global diversity, and character development. Digital transformation is not merely the adoption of technology but rather an organizational process that strengthens teachers' professional capacity and learning practices. Nevertheless, these findings have limitations, including a small sample size, an ex post facto cross-sectional design, and reliance on questionnaire data. Future research should involve a larger, more diverse sample, a longitudinal or mixed-methods design, and direct measurements of student competencies to test whether the observed relationships remain consistent across schools and regions.

Conflict of Interest

The authors declare that they have no conflict of interest.

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