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The Effects of Principal Leadership and Teacher Competence on the Learning Quality: Does the Mediation of Infrastructure Matter?

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ABSTRACT

Objective: Good infrastructure can help teachers in presenting learning materials better. Infrastructure can also assist principals in conducting school administration management more efficiently to focus on developing the quality of learning. This study aims to explore the role of infrastructure as a mediator of the influence of principal leadership and teacher competence on the quality of learning. **Method:** This study used a quantitative survey of randomly selected 42 teachers at SHS 1 Kawedanan Magetan. Data collection was carried out using a questionnaire consisting of a Likert scale with 5 points. PLS-SEM analysis is used to analyze data and test conceptual models. Data analysis techniques include statistical tests to test relationships and mediation. **Results:** The results showed that the quality of learning was directly influenced insignificantly by the principal (β=-0.097; ρ=0.522) and teacher competence. **Novelty:** Infrastructure mediates significantly in improving the quality of learning. Schools and educational institutions must invest time and resources in training and professional development for teachers and principals in leadership, classroom management, and effective teaching methods. The overall quality of learning will improve when the principal can lead the school towards a clear vision of learning, and teachers have adequate skills and knowledge to plan, implement, and evaluate learning effectively.

INTRODUCTION

Quality measures the good and bad of something, quality degrees or levels. Meanwhile, learning is an effort to change student behavior for the better. According to Jiménez-Bucarey et al. (2021), learning quality is a standard process for implementing learning in education to achieve graduate competence. The quality of learning is also referred to as the level of achievement of learning objectives in learning activities (Khakimov & Sharopov, 2023; Mulay & Khanna, 2020). Creating a good quality of learning is not an easy thing to achieve. Many variables influence the quality of learning in these schools, such as the principal leadership model, school culture, and teaching and learning process. Furthermore Safrida et al. (2023) explained that there were also challenges in improving the quality of learning in schools, including because teachers have not fully realized their responsibilities in planning and implementing learning activities that have optimal quality, limited infrastructure, lack of student awareness about the importance of learning optimally, a weak discipline culture, teaching strategies or methods that less varied (Demissie & Egziabher, 2022; Kundu & Bej, 2021; Sutrisno et al., 2023)

Kamrat et al. (2022) mention several components that must be considered to improve the quality of education, including practical and positive leadership, high expectations, monitoring student progress, student responsibility, and participation, intensives, and rewards, parental involvement in school life, planning, and consistent approach. According to Jiménez-Bucarey et al. (2021), Khakimov & Sharopov (2023), and Sutrisno

et al. (2023), schools have seven quality indicators, including curriculum, achievement, learning and teaching, student support, school ethos, resources, and leadership management and quality assurance. According to Mulay and Khanna (2020), several indicators support improving the quality of history learning, including teacher expertise, infrastructure for history learning, academic culture, student perceptions of history learning, and student encouragement.

The importance of principal leadership relates to the principal's need to increase opportunities to hold effective meetings with teachers in a conducive environment (Putra et al., 2022; Safrida et al., 2023). A positive school behavior principal can encourage, direct, and encourage teacher performance by showing friendship, closeness, and consideration towards teachers as a group and individually. Instrumental principal behavior is tasks that are oriented and directly clarified in the roles and responsibilities of teachers, both as a group and individually (Berkovich & Eyal, 2017; Ken et al., 2023). Apart from principal leadership, teacher ability is essential in improving the quality of learning. Competent teachers have the proper knowledge and skills to teach and the ability to manage the classroom well. Competent teachers can motivate students to learn effectively and support their cognitive, social, and emotional development (Kamrat et al., 2022; Matitaputty & Sopacua, 2023).

According to Galdames-Calderón (2023), school principals have many roles in carrying out their responsibilities, one of which is being able to act as an educator for teaching and educational staff. As educators, school principals must continue striving to improve teacher learning quality. In this case, the experience factor will significantly influence the professionalism of school principals, especially in helping to shape the education staff's understanding of what they are learning, according to Li et al. (2023), which states that the commitment of teachers and school principals is the most critical component in efforts to improve teacher competence. This shows that teachers and principals have a relationship that influences each other in the school structure. However, the principal position provides direction and training on teacher abilities and performance (Puruwita et al., 2022; Wahyudi et al., 2023). School principals can provide training to strengthen teachers' potential, role, and function as educators.

Factors that support the principal leadership management in improving the performance of teachers and education are as follows: internal factors include the principal's ability to manage various school plans and patience in dealing with different teachers. External factors include adequate school facilities and parental support. According to Demissie & Egziabher (2022), the m, the most common factors influencing employee performance are competence (ability), leadership, recovery, motivation, education and training, experience, work environment, organizational culture, and job satisfaction. The results show that motivation, leadership, and organizational culture are still highly debated.

A teacher is a person who can build an enjoyable, safe, comfortable, and conducive learning environment. If he is among the students, he can help reduce the atmosphere of harsh learning, rigidity, and boredom (Brink et al., 2023; Hanaysha et al., 2023). Only some people can overcome such conditions, so a teacher must have expertise. The The author knows that professional teachers are essential (Antera, 2021; Baumgartner, 2022). They influence the quality of the education process. If they want to become professionals, they must be able to actualize themselves and discover their own identity. Over the past decades, educational development has been given very low

priority, significantly impacting national and international life (Codina & Robinson, 2024).

According to Antera (2021), Codina & Robinson (2024), and Puruwita et al. (2022), several factors cause teachers to only sometimes have competencies that meet standards or are even far from standards. Internal factors include an individual's educational background, teaching experience, work ethic, upgrading, and training. In contrast, external factors come from outside the individual, such as workplace climax, organizational welfare, workplace social environment, infrastructure, etc. As a result of interactions, the quality of teacher competence in carrying out the learning process can be influenced. According to Sutrisno et al. (2023), teachers' lack of professional competence in improving the quality of education still needs to be solved. Various abilities, such as pedagogical abilities, professional abilities, personality abilities, and social abilities, must support teachers. Teachers must inform students and act as managers of learning resources that benefit their students (Ma'arif et al., 2023). Teachers must be able to utilize information and impacts from various branches of science to improve their critical thinking abilities.

This research highlights the critical role of facilities and infrastructure as mediators in the influence of school principal leadership and teacher competence on the quality of learning. The novelty of this research lies in its approach, which integrates three main elements in education, namely leadership, competence, and facilities, in one comprehensive analytical framework. The urgency of this research arises from the urgent need to improve the quality of learning amidst various educational challenges in Indonesia, including limited facilities and the need to improve the quality of human resources. The contribution of this research is very significant because it can provide practical guidance for policymakers and educational implementers in optimizing the use of school facilities and infrastructure to strengthen the positive impact of teacher leadership and competence, thereby creating a more effective and high-quality learning environment in high schools.

LITERATURE REVIEW

The influence of principal leadership on infrastructure and the quality of learning

Studies on the influence of school principals' leadership on infrastructure and the quality of learning show that improving the quality of education is very important. It is recognized that the principal's leadership is a significant component that can determine the course and success of the educational institution. School principals are essential in designing policies, allocating resources, and managing infrastructure through visionary and proactive leadership. Sap is vital because it functions as an infrastructure that supports the learning process. The principal's success in managing infrastructure can create a safe, comfortable, and adequate learning environment. In this context, research can show how principal leadership influences planning, resource allocation, and infrastructure improvement to support learning quality. Such factors greatly influence the quality of learning as a measure of educational success (Galdames-Calderón, 2023; Li et al., 2023).

The influence of teacher competence on structure and the quality of learning

In education, teachers' ability is very important in determining the quality of school learning. High-quality teachers can improve students' academic achievement. However, it is essential to remember that teacher abilities include teaching skills and using and maintaining infrastructure that supports learning (Jiménez-Bucarey et al., 2021; Kamrat

et al., 2022). Studies show that teachers' abilities not only affect their direct interactions with students but also how students use infrastructure in the classroom (Brink et al., 2023; Hanaysha et al., 2023). Teachers' ability affects not only their direct interaction with students but also how they use the classroom's infrastructure.

The influence of infrastructure on the quality of learning

The influence of infrastructure on the quality of education is essential. Good infrastructure in the educational context includes various things, such as safe and comfortable school buildings, complete libraries, sports facilities, computer laboratories, and adequate transportation facilities for students and teachers. Good infrastructure ensures that education is accessible without physical or geographical barriers. Schools that are easy to reach for students and teachers can increase participation and attendance in the learning process. Infrastructure such as computer laboratories, science laboratories, and well-equipped libraries can improve the quality of teaching by providing teachers with the means to deliver material interactively and stimulate students' interest in learning (Haleem et al., 2022; Matitaputty & Sopacua, 2023; Sanusi et al., 2022).

The influence of the mediating role of infrastructure on the influence of the principal leadership and teacher competence on the quality of learning

To improve the education system, research on the role of mediation of infrastructure in the relationship between the leadership of school principals and teacher competence in the quality of learning is very important (Destari et al., 2023; Sutrisno et al., 2023). Infrastructure, which includes physical facilities, technology, and other resources, is essential to the educational environment. All this contributes to the comfort and effectiveness of the learning process (Brink et al., 2023; Hanaysha et al., 2023; Kundu & Bej, 2021). Nonetheless, there are questions about how the role of infrastructure can balance the impact of headmaster leadership on the quality of learning (Khakimov & Sharopov, 2023; Safrida et al., 2023; Yan et al., 2022).

RESEARCH METHOD

Research Design

This type of research uses quantitative analysis with data collection techniques using questionnaires (Apriliani et al., 2023; Putra et al., 2022; Widayanto et al., 2021). This research design uses an explanatory and correlational approach using Partial Least Squares Structural Equation Modeling (PLS-SEM), an approach used to explore the relationship between variables in a conceptual model. PLS-SEM allows researchers to test models holistically, including identifying cause-and-effect relationships and correlation relationships between variables, thereby providing a deeper understanding of the observed phenomena.

Participants and Data Collection

Research design with an explanatory and correlational approach to determine the relationship between independent variables (principal leadership and teacher competency), mediation (infrastructure), and dependent variables (learning quality). The research method used a survey through purposive sampling. The sample for this research was teachers at SHS 1 Kawedanan Magetan, with a total sample of 42 respondents. Data collection was carried out using a survey method via Google Forms.

The measurement uses a 4-point Likert scale from 1 = disagree to 4 = strongly agree (Daryono et al., 2020; Widyastuti et al., 2023). Research instrument variables are shown in Table 1.

Table 1. Research variable construct.

Variables	Indicators	Construct	References
Principal Leadership (X1)	Personality	KKS 1	(Berkovich & Eyal, 2017; Chen, 2024; Galdames-Calderón, 2023; Ken et al., 2023; Kin & Abdull, 2018; Li et al., 2023)
	Knowledge of educational staff	KKS 2	
		KKS 3	
	School vision and mission	KKS 4	
		KKS 5	
	Professional abilities	KKS 6	
		KKS 7	
Teacher Competency (X2)	Pedagogical competence	KMG 1	(Antera, 2021; Baumgartner, 2022; Cañadas, 2023; Gao et al., 2023; Hanaysha et al., 2023; Rahimi & Mosalli, 2024; Wahyuni et al., 2020)
		KMG 2	
		KMG 3	
	Personality competency	KMG 4	
		KMG 5	
		KMG 6	
	Social competence	KMG 7	
		KMG 8	
Learning Quality (Y)	Teacher behavior	KLP 1	(Jiménez-Bucarey et al., 2021; Kamrat et al., 2022; Khakimov & Sharopov, 2023; Matitaputty & Sopacua, 2023; Safrida et al., 2023; Yan et al., 2022)
	Student learning behavior and impact	KLP 2	
	learning climate	KLP 3	
		KLP 4	
	learning materials	KLP 5	
	instructional Media	KLP 6	
	learning system	KLP 7	
Infrastructure (Z)	Number of Classrooms	SPR 1	(Akram & Abdelrady, 2022; Brink et al., 2023; Destari et al., 2023; Haleem et al., 2022; Hanaysha et al., 2023; Sanusi et al., 2022; Sutrisno et al., 2023)
		SPR 2	
		SPR 3	
	Library Availability	SPR 4	
	Laboratory facilities	SPR 5	
		SPR 6	
	Sports facilities	SPR 7	
	Accessibility	SPR 8	
		SPR 9	

Research Hypothesis

Regarding the continuity between the concept and the results of previous research, we formulate the following hypothesis:

H-IND$_{1\&2}$: Principal leadership affects improving the quality of learning and infrastructure

H-IND$_{2\&4}$: Teacher competence affects improving the quality of learning and infrastructure

H-IND$_5$: Infrastructure affects improving the quality of learning

H-IND$_{1\&2}$: Infrastructure mediates the positive influence on the influence of principal leadership and teacher competence on the quality of learning

Data Analysis

Statistical analysis of this research uses the PLS-SEM measurement technique. The outer model testing stage is a measurement model testing stage that aims to prove the validity and estimate the reliability of indicators and constructs. Several requirements that must be met are the indicator loading factor (λ >0.70) and the reflective construct AVE (>0.50) (Daryono et al., 2024; Fauzan et al., 2023; Supriyanto et al., 2022). Reliability estimates use Cronbach Alpha, rho_A, and CR values (>0.70). The goodness of fit model testing stage aims to test the predictive power and feasibility of the model. The criteria that must be met include predictive relevance to see the model's predictive power on the blindfolding output (Daryono et al., 2023; Hariyanto et al., 2022). The inner model testing stage tests the significance of the direct (H-DIR1-5) and indirect effects (the mediating role of H-IND1-2).

RESULTS AND DISCUSSION

Results

Evaluation of Measurement Models

Evaluation of measurement models is very important to ensure that the indicators used to measure latent constructs or variables are consistent with the research objectives and of good quality. Examining construct validity is the primary goal of measuring model evaluation. Analyzing the relationship between the indicator and the measured construct can ensure that the indicator truly reflects the intended aspect of the construct. By analyzing factor loadings, reliability, and discriminant validity, researchers can decide which indicators should be included in the analysis and which should be omitted.

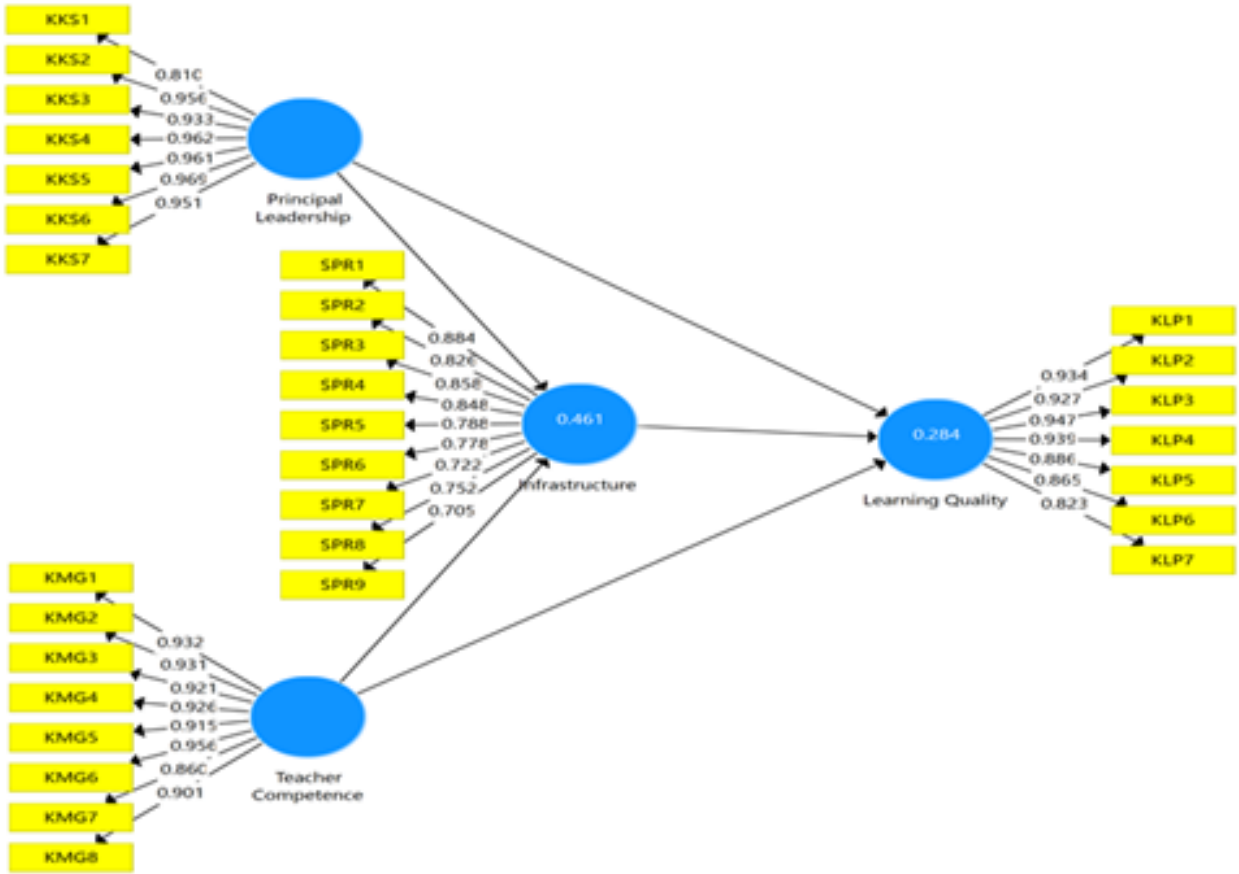

Figure 1. Evaluation of the measurement model.

The convergent validity measurement has a standard loading factor value limit of 0.700. Based on the value of the factor loading coefficient in Table 2, the most dominant question item in measuring the principal leadership variable (X) is the professional ability of 0.969 (PSC 6). At the same time, the weakest item in the variety of infrastructure is the construction of laboratory facilities of 0.722 (SPR7). The Average Extracted Variance (AVE) value of each variable has a value of >0.50, namely the principal leadership (X1) of 0.876, teacher competence (X2) of 0.843, learning quality (Y) of 0.636, and infrastructure 0.817. So, each subvariable and variance in the research model instrument meets the convergent validity requirements. The SmartPLS output in Table 3 shows that all variables have CA values (0.928 to 0.0932), rho_A (0.931 to 0.982), and CR (0.940 to 0.980). So, the instrument's internal consistency in 4 aspects is>0.70.

Table 2. Outer model: Convergent validity.

Variables	Indicators	Conver Validity		Consistency Reliability		
		FL (>0.70)	AVE (>0.50)	CA (α>0.70)	Rho-A (φ>0.70)	CR (>0.70)
Principal Leadership(X1)	KKS 1	0.810	0.876	0.976	0.982	0.980
	KKS 2	0.956				
	KKS 3	0.933				
	KKS 4	0.962				
	KKS 5	0.961				
	KKS 6	0.969				
	KKS 7	0.951				
Teacher Competency(X2)	KMG 1	0.932	0.843	0.973	0.976	0.977
	KMG 2	0.931				
	KMG 3	0.921				
	KMG 4	0.926				
	KMG 5	0.915				
	KMG 6	0.956				
	KMG 7	0.860				
	KMG 8	0.901				
Infrastructure(Z)	SPR 1	0.884	0.817	0.928	0.931	0.940
	SPR 2	0.826				
	SPR 3	0.858				
	SPR 4	0.848				
	SPR 5	0.788				
	SPR 6	0.778				
	SPR 7	0.722				
	SPR 8	0.752				
	SPR 9	0.705				
Learning Quality(Y)	KLP 1	0.934	0.636	0.962	0.968	0.969
	KLP 2	0.927				
	KLP 3	0.947				
	KLP 4	0.939				
	KLP 5	0.886				
	KLP 6	0.865				
	KLP 7	0.823				

The Fornell-Larcker test is one of the methods used in Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the discriminant validity of the constructs in a model. This test aims to ensure that the different constructs in the model can be distinguished from each other. This is done by comparing the variance explained by the construct with those explained by other constructs in the model. If the variance explained by one construct is more significant than that explained by another, then the construct has good discriminant validity. When viewed from the correlation value in Table 3, the correlation value of principal leadership (X1) is 0.936, more significant than the correlation value of teacher competence (X2) of 0.918, followed by the quality of learning (Y) of 0.904, and the lowest correlation value of sarpas (0.798), likewise for the assessment of correlation of other variables.

Table 3. Discriminant validity: The fornell larcker.

Variables	X1	X2	Y	Z
X1. Principal Leadership	0.936			
X2. Teacher Competence	0.453	0.918		
Y. Learning Quality	0.214	0.346	0.904	
Z. Infrastructure	0.527	0.620	0.526	0.798

One of the primary purposes of HTMT testing is to measure the validity of discriminants in models. HTMT checks the extent to which constructs measured by different indicators represent the same or different constructs in the model. HTMT is also helpful in assessing multicollinearity between constructs in models. Multicholinerity can occur when constructs are strongly interrelated, leading to problems in estimating and interpreting results in SEM analysis. Meanwhile, the PLS algorithm test results in Table 4 show that the HTMT value in all dimensions is <0.90 (0.213 to 0.644).

Table 4. Discriminant validity: The HTMT.

Variables	X1	X2	Y	Z
X1. Principal Leadership				
X2. Teacher Competence	0.462			
Y. Learning Quality	0.213	0.347		
Z. Infrastructure	0.555	0.644	0.547	

Evaluation of Structural Models

R^2 (Coefficient of Determination) provides an overview of how well the PLS-SEM model explains variation in the observed endogenous variables (constructs). The higher the R^2 value, the more significant the proportion of variation in the construct that the model can explain. R^2 allows comparison between different PLS-SEM models. Researchers can use R^2 values to compare the effectiveness of different models in explaining variation in observed constructs. Based on Table 5, the R^2 coefficient on the learning quality variable, a value of 0.284, is obtained; this can be interpreted as the Principal Leadership, teacher competence, and infrastructure affect the learning quality variable by 28.4% and other variables outside the research model influence the remaining 61.6%.

□² helps determine how significant the contribution of latent variables is to the observed construct. □² allows comparison between the contributions of several latent variables to the same construct. So that it can be determined which latent variables have

the most decisive influence on the observed construct. So, the output effect size shows that the most dominant variable in influencing teacher competence is infrastructure (f^2=0.223 in the large category, and the weakest variable is teacher competence (f^2= 0.002) in the small category.

Table 5. Measurement of structural model: R2, f2, Q2.

Variable	R2		f2		Q2				Predictive
					Redundancy		Communality		
	Value	Decision	Value	Decision	SSE	Q2 (1-SSE/SSO) >0.35	SSE	Q2 (1-SSE/SSO) >0.35	
X1. PL			0.009	Small	294		60	0.793	Strong
X2. TC			0.002	Small	336		80	0.760	Strong
Y LC	0.284	Moderate	-		233	0.204	77	0.736	Strong
Z. I	0.461	Moderate	0.223	Large	270	0.284	168	0.554	Strong

The next test, by looking at the value of predictive relevance (Q2), aims to validate the model's predictive capabilities by reality in the field. Based on the Table 5, all Q2 values exceed the intersection point (greater than zero). The calculation of predictive relevance Q2 obtained values of 0.284 to 0.204 in redundancy constructs and 0.554 to 0.793 in cross-validated communality constructs. So, the model measuring the overall quality of learning can explain modern analysis by 28.4% to 79.3% of the phenomenon studied. The results of both procedures show that the quality of learning has strong predictive power.

Measurement of Direct Effects

One of the primary purposes of hypothesis testing is to examine the relationships between variables in the proposed model. This is done by analyzing the strength and significance of the relationships between the variables identified in the model. Direct effect evaluation allows researchers to test the consistency between empirical findings and theories that support the model. In addition, this test analyzes the significance of the mediating effect in the research model. Understanding the mechanisms underlying relationships between variables and how certain variables can mediate or change relationships between other variables is important.

Figure 2 shows H-DIR1 can be accepted with significant criteria if it has a statistical T value above 1.96. At the same time, the hypothesis can be accepted with a positive or negative influence if the acquisition of the value of the B-values coefficient shows the direction of positive or negative influence. Based on Table 6, in the H1 hypothesis, the principal leadership (X1) → the quality of learning (Y) obtained β-values = -0.097 and p-values = 0.522 (0.05). This shows that the Principal Leadership variable (X1) has a negative and insignificant effect on the quality of learning (Y). This can be interpreted as the fact that when the principal leadership variable increases, the variable of learning quality will also increase, but not significantly. In hypothesis H3, the principal leadership (X1) → infrastructure (Z) obtained β- values = 0.310 and p values = 0.015 (0.05). This shows that the principal leadership variable (X1) positively and significantly affects infrastructure (Z). It can be interpreted that when the principal leadership increases, the infrastructure variables will also increase and vice versa.

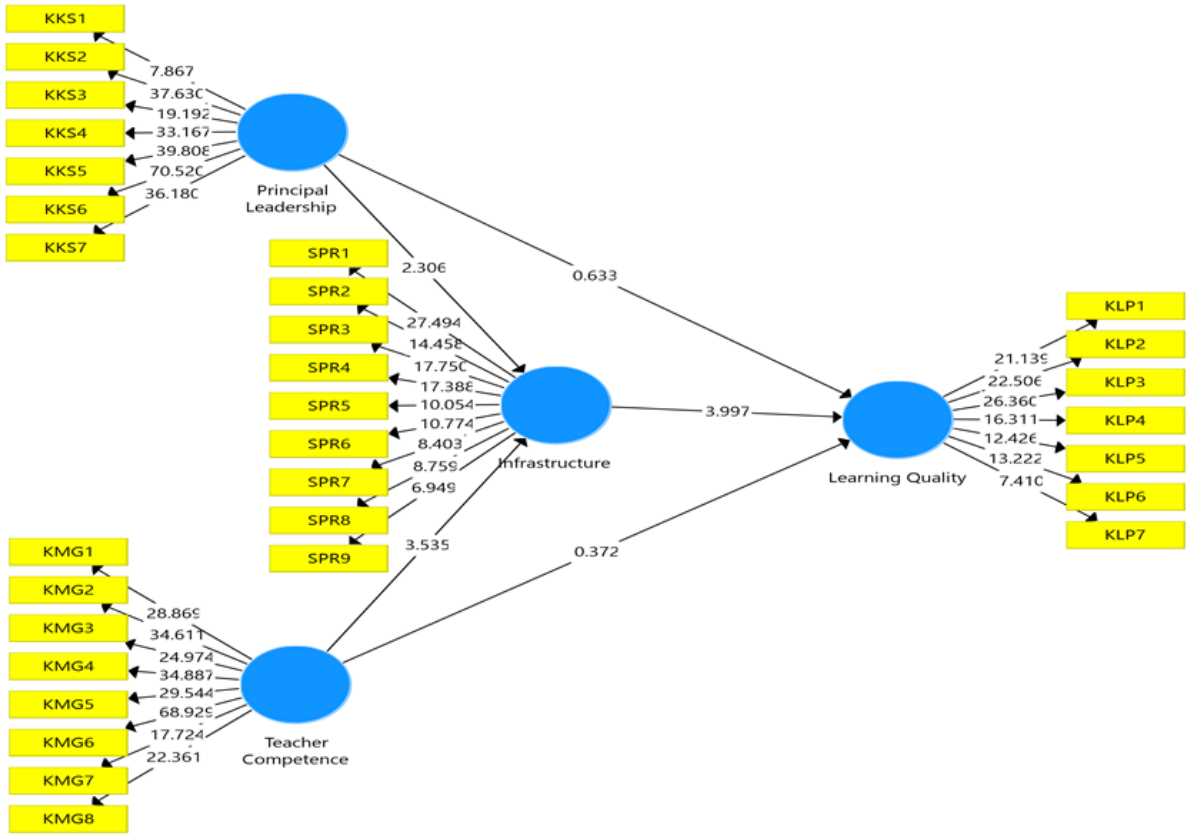

Figure 2. Evaluation of path analysis.

Table 6. Results of path confidence direct effects.

Hyp.	Path Analysis	β-values (+/-)	Sample Mean	SDV	T-statistic (>1.96)	P- values (< 0.05)	Decision
H-DIR1	KKS→KLP	-0.097	-0.091	0.152	0.641	0.522	Rejected
H-DRI2	KMG→KLP	0.053	0.031	0.149	0.355	0.723	Rejected
H-DRI3	KKS→SPR	0.310	0.218	0.127	2.434	0.015	Accepted
H-DRI4	KMG→SPR	0.480	0.483	0.129	3.714	0.000	Accepted
H-DRI5	SPR→KLP	0.544	0.566	0.142	3.824	0.000	Accepted

The mediating role of infrastructure on the influence of the Principal Leadership and teacher competence on the quality of learning

Based on Table 7, in the H-IND1 hypothesis, the results of testing the mediating effect of the variable infrastructure (Z) can be concluded that there is a positive influence (β-values = 0.168) and not significant (T static 1.840 >1.96 and P values 0.066 <0.05) between the Principal Leadership factor (X1) on the quality of learning (Y). So H-IND1 states, "There is a positive and insignificant influence on the role of infrastructure in mediating the principal leadership on the quality of learning." In the H-IND2 hypothesis, the results of testing the mediating effect of the variables of infrastructure (Z) can be concluded that there is a positive (β-values = 0.261) and significant (T statistic 2.521 >1.96 and P values 0.012 <0.05) between teacher competence (X2) on the quality of learning (Y). So H-IND2 states, "There is a positive and significant influence on the role of infrastructure in mediating teacher competence on the quality of learning."

Table 7. Results of path confidence direct effects.

Hyp.	Path Analysis	β-values (+/-)	SDV	T-statistic (>1.96)	P-values (< 0.05)	Decision	Mediating Role
H-IND1	KKS→SPR→KLP	0.168	0.092	1.840	0.066	Rejected	Full Mediation
H-IND2	KMG→SPR→KLP	0.261	0.104	2.521	0.012	Accepted	Full Mediation

Discussion

The results of this study became the highest measuring factor for the principal leadership variable, namely decision-making ability. This means that the principal can analyze the situation well before making decisions that affect the entire school. However, this study needs to be more consistent with Li et al.'s (2023) assessment of the knowledge of education personnel. So, the headmaster still needs to contribute to reforms that improve education. The results of this study also measure the highest factor for the principal's variable, namely the vision and mission of the school. This means that the principal transparently communicates the development and achievement of the school's vision and mission to all relevant parties (Berkovich & Eyal, 2017; Chen, 2024). However, this study needs to be more consistent with Kin & Abdul Kareem's (2018) research related to the principal's personality. The principal still needs to consistently set an example of discipline when carrying out his duties and functions.

This research can provide an in-depth picture of how principals' leadership, infrastructure conditions, and students' learning experiences relate to each other (Destari et al., 2023). The results of this study can be used as a basis for policy-making on more efficient strategies to improve learning quality, including improving infrastructure in various educational institutions. Given the critical importance of principals' leadership on infrastructure and learning quality, this study contributes to the educational literature. It has a practical impact on educational policy-making that can improve the quality of education across schools. Therefore, this study will provide essential knowledge for policymakers, school principals, and education practitioners to help improve the quality of education (Safrida et al., 2023).

The results of this study are the lowest measuring factor for teacher competence variables, namely social competence. This can mean that teachers still often have inclusive attitudes, act objectively, and discriminate against religion, gender, physical condition, race, family background, and social status. However, this study needs to be more consistent with Rahimi and Mosalli's (2024) research on social competence. Where teachers can integrate social-emotional competence into teaching practices and interaction styles with students. The results of this study are the lowest measuring factor for teacher competence variables, namely pedagogic competence; teachers need to understand students' characteristics. However, this study needs to be more consistent with aa20 research on social competence (Antera, 2021; Baumgartner, 2022), where teachers can integrate social-emotional competencies into teaching practices and student interaction styles.

Teacher competence's influence on education quality is very large and has high urgency. Competent teachers have the knowledge and skills necessary to convey lesson material in a way that is easily understood by students (Cañadas, 2023). They can use various teaching methods that suit students' learning styles and facilitate an active and

interactive learning process. High teacher competency directly impacts student academic achievement (Gao et al., 2023; Rahimi & Mosalli, 2024). Teachers who can convey material, provide constructive feedback, and provide individual support to students will help improve their understanding and academic achievement. Competent teachers contribute to increasing the school's reputation in terms of educational quality. Schools that have a quality teaching team tend to attract the interest of students and parents and gain recognition from the community and other educational institutions (Hanaysha et al., 2023; Wahyuni et al., 2020).

The results of this study became the highest measuring factor in the infrastructure variable, namely the number of classrooms. This means that the school has covered the availability of learning facilities such as classrooms, chairs, and LCDs, which are quite adequate. However, this study is consistent with Brink et al. (2023) research related to sports facilities. So schools are recommended to cover the availability of adequate sports facilities. The results of this study became the highest measuring factor in the infrastructure variable, namely the number of classrooms. This means the school has provided adequate computer and internet availability (Destari et al., 2023). However, this study needs to be more consistent with Maryanti and Asjjari's (2022) research on school action. Schools need to recommend student organization spaces that are not strategically located and difficult to access to be strategic and easily accessible.

The results of this research reveal that infrastructure influences the quality of education. A comfortable and safe learning environment can help students and teachers focus on the learning process. A school building that is well-maintained and equipped with adequate facilities can create an atmosphere conducive to learning (Yangambi, 2023). Adequate sports and arts facilities are also important for developing students' potential outside the classroom. Students can develop social skills, leadership, and creativity through extracurricular activities and facilities. Good infrastructure also includes facilities for teacher welfare, such as a comfortable teacher's room and health facilities. Teachers' well-being directly impacts the quality of their teaching and their motivation to develop students (Akram & Abdelrady, 2022).

The results of this study became the highest measuring factor in the variable of learning quality, namely in learning material. This can be interpreted as the teacher's need to ensure that the learning material indicators help determine the level of understanding of student's concepts of the material that has been taught. This study is consistent with Jiménez-Bucarey et al. (2021) research on learning climate. Where teachers can create a good classroom atmosphere to support more focused learning. The results of this study became the lowest measuring factor in the variable of learning quality about learning media. It can be interpreted that teachers do not ensure that learning media include the availability and accessibility of learning media to run effectively. However, this study is inconsistent with Safrida et al. (2023)research on student behavior and impact, where teachers can encourage active participation of students in learning, including involving them in discussions, work groups, and practical activities.

This research is fundamental because it can provide insight into the infrastructure's role as a mediator in optimizing the positive influence of principal leadership and teacher ability on the quality of learning (Chen, 2024; Ken et al., 2023; Li et al., 2023). The results can provide a foundation for better school policy-making, empowering principals to manage infrastructure and developing teachers' abilities to improve the

quality of learning. As a result, the study adds to the missing information and helps improve the education system (Machmud, 2020).

The mediating role of school infrastructure in the influence of school principal leadership on the quality of education is very important. Adequate school infrastructure facilitates the implementation of policies led by school principals. For example, if a school principal has a vision to increase the use of technology in learning, infrastructure such as the availability of computers and fast internet access will enable this vision to be realized more effectively (Akram & Abdelrady, 2022; Haleem et al., 2022; Matitaputty & Sopacua, 2023). Good infrastructure can increase the effectiveness of a school principal's leadership by providing the necessary physical and logistical support. School principals with adequate infrastructure will better manage resources efficiently and effectively to support the learning process.

The mediating role of school infrastructure in the influence of teacher competence on the quality of education is also very important. Good school infrastructure provides physical support to teachers in carrying out their duties. Facilities such as comfortable classrooms, laboratories, libraries, and adequate technological devices will help teachers deliver material effectively and interestingly (Antera, 2021; Brink et al., 2023; Khakimov & Sharopov, 2023; Rahimi & Mosalli, 2024; Yan et al., 2022). Adequate infrastructure provides opportunities for teachers to develop their skills and competencies. For example, complete laboratory or library facilities can be used as learning resources and places to conduct research or experiments, thereby increasing teacher competence in teaching. Comfortable and safe infrastructure can also help maintain teachers' physical and mental well-being. A good work environment will make teachers feel appreciated and motivated to do their best to carry out their duties.

CONCLUSION

Fundamental Finding: Regarding developing high-quality education, research on the mediating role of infrastructure in the reciprocal relationship between teacher ability and learning quality must be addressed. Infrastructure, which includes physical facilities, technology, and other resources in the learning environment, is critical to determining whether teachers support or hinder the teaching process. So far, the education literature has heavily emphasized the relationship between teacher ability and learning quality, emphasizing the positive impact of teacher ability on student achievement. **Implication:** However, how infrastructure functions as a mediator to amplify or dampen the impact of teacher ability on learning quality still needs further attention. Thus, the results of this study can not only provide a solid theoretical foundation but also make a real contribution to education development policies that focus on improving learning quality centered on optimizing infrastructure and improving teacher competence. This research is critical to understanding the complex dynamics between these factors. **Limitation:** Based on the results of the study on the mediating role of infrastructure on the relationship between teacher competence and learning quality, it is recommended that schools and education providers implement strategies that maximize infrastructure and teacher competency development. To create an ideal learning environment, improving the school's technological and physical facilities is first necessary. **Future Research**: Regular maintenance and renewal are required to ensure the positive effects of infrastructure last. Program development and teacher training should also be designed to focus on using technology in the teaching and assessment process. Collaboration between school principals, teaching staff, and

related parties can help implement policies that support infrastructure development and teacher upgrading. Schools can implement these strategies to create innovative and high-quality learning environments that contribute positively to students' academic achievement and overall potential development.

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