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The Effect of Mathematics Teachers' Pedagogical Competence on Students' Learning Outcomes in Mathematics for Grade XI at Muhammadiyah 3 Senior High School, Sidoarjo

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ABSTRACT

Teachers' pedagogical competence is considered one of the key factors influencing the effectiveness of the learning process and students' academic achievement. However, differences in pedagogical competence among mathematics teachers, particularly in adapting instructional strategies and technology integration, may contribute to variations in student learning outcomes. Therefore, this study aimed to analyze the effect of mathematics teachers' pedagogical competence on the learning outcomes of Grade XI students at Muhammadiyah 3 Senior High School, Sidoarjo. This study employed a quantitative approach using an ex post facto research design. The population consisted of teachers and students of Muhammadiyah 3 Senior High School Sidoarjo, in the 2025/2026 academic year. The sample comprised two mathematics teachers and 34 Grade XI students selected through purposive sampling. Data were collected using questionnaires, documentation, observations, and interviews. Data analysis included descriptive statistics, normality and homogeneity tests, Pearson correlation analysis, simple linear regression, F-test, and t-test. The findings revealed that teachers' pedagogical competence was generally categorized as good, particularly in explaining learning materials, understanding students' learning needs, selecting appropriate teaching methods, and providing feedback. Students' mathematics learning outcomes achieved an average score of 79.47, indicating a fairly good level of achievement. Pearson correlation analysis demonstrated a very strong positive relationship between pedagogical competence and learning outcomes ($r = 0.987$, $p < 0.05$). Furthermore, the results of the regression analysis, F-test, and t-test confirmed that teachers' pedagogical competence had a significant positive effect on students' mathematics learning outcomes.

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1. INTRODUCTION

Education is the fundamental foundation for building a better civilization. As an organized process, education not only plays a role in developing individual capacities but also serves as a means of shaping a quality society [1]. From a systems perspective, education is understood as a unified whole consisting of interconnected elements working together to achieve common goals [2]. Education aims to develop and utilize the diverse potentials of all members of society and improve their future lives [3]. The goals of education will be achieved when young people consciously understand the importance of education [4].

In the field of education, the role of teachers is crucial, as they function not only as instructors but also as facilitators and motivators in the learning process [5]. According to [6], one of the key aspects underlying successful learning is teachers' pedagogical competence, which includes their ability to plan, implement, and evaluate the learning process. Strong pedagogical competence is believed to improve the quality of learning, which in turn positively affects students' learning outcomes [7].

Teachers with good pedagogical competence are expected to create a conducive learning environment, increase student engagement, and facilitate optimal student development. In the learning process, teachers must also be innovative [8]. However, many teachers today struggle to manage their students effectively and sometimes neglect their responsibilities. Teaching in the present era is more complex than in the past, requiring teachers who are both inspirational and professional [9].

This is especially important given the rapid advancement of technology, which requires teachers to adapt and master technological developments [10]. Students' learning outcomes serve as a measure of the success of the learning process conducted by teachers. According to [11], learning outcomes essentially aim to measure both teaching effectiveness and student achievement. Learning outcomes are not limited to academic scores but also include the development of skills, attitudes, and knowledge gained during the learning process [12].

Preliminary observations conducted through an interview with the principal of Muhammadiyah 3 Senior High School Sidoarjo, on November 1, 2025, revealed that mathematics is one of the least preferred subjects among students. The interview also indicated variations in pedagogical competence among mathematics teachers, particularly in relation to technology integration and instructional approaches. Students taught by teachers who effectively utilize innovative teaching methods and technology tend to demonstrate better learning outcomes than those taught through conventional approaches[13]. This condition highlights the need for empirical investigation regarding the influence of teachers' pedagogical competence on students' mathematics achievement [14].

Muhammadiyah 3 Senior High School Sidoarjo, was selected as the research site because it represents an educational institution committed to academic excellence while emphasizing character development and competency-based learning. Despite having adequate facilities and a supportive educational environment, challenges related to enhancing pedagogical competence remain evident. Understanding the extent to which

pedagogical competence contributes to student learning outcomes is therefore important for improving instructional quality within the institution. Based on the identified problems, this study seeks to examine the effect of mathematics teachers' pedagogical competence on the learning outcomes of Grade XI students at Muhammadiyah 3 Senior High School Sidoarjo. Specifically, the study aims to: (1) describe the level of pedagogical competence possessed by mathematics teachers, (2) identify students' mathematics learning outcomes, and (3) analyze the influence of teachers' pedagogical competence on students' mathematics achievement.

The findings of this study are expected to provide both theoretical and practical contributions. Theoretically, the study will enrich the literature regarding the relationship between pedagogical competence and student learning outcomes, particularly in mathematics education [15]. Practically, the results may serve as valuable information for teachers, school administrators, and educational policymakers in designing professional development programs that strengthen pedagogical competence and improve instructional effectiveness. Ultimately, enhancing teachers' pedagogical competence is expected to contribute to better student achievement and the overall improvement of educational quality.

2. METHOD

Type of Research

This study uses a quantitative method with an ex post facto approach. Quantitative research relies on systematic procedures using numerical data to analyze social phenomena [16], while ex post facto research examines events that have already occurred [17]. The researcher does not manipulate variables but analyzes existing data to identify relationships and possible causal factors. This approach is suitable when experimental control is not feasible, especially in social research contexts.

Population and Sample

The population includes all teachers and students of Muhammadiyah 3 Senior High School Sidoarjo, in the 2025/2026 academic year, totaling 369 students and 48 teachers. A sample is a subset of the population [18]. This study uses purposive sampling [19], selecting participants based on specific criteria. The sample consists of 2 mathematics teachers and 34 Grade XI students, chosen to provide relevant and in-depth data.

Time and Place of Research

The study was conducted at Muhammadiyah 3 Senior High School, Sidoarjo, located in Sidoarjo, East Java. The school was selected due to its relevance to the research focus on pedagogical competence and student learning outcomes, as well as its complete academic data and accessibility. The research was carried out from November 2025 to March 2026, aiming to provide an accurate understanding of the relationship between teachers' pedagogical competence and students' learning outcomes.

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Data Collection Techniques

According to [20], data collection techniques are methods used to gather the information needed in research. These techniques must be accurate and appropriate to ensure that the data can be easily analyzed and lead to valid conclusions. In this study, data were collected using questionnaires, observation, documentation, and interviews.

1. Questionnaire
   A questionnaire is a measurement tool used to collect research data [21]. In this study, it is used to assess all research variables using a Likert scale to measure levels of agreement. The questionnaire uses a checklist format with scores ranging from 1 to 5, representing:
   a. "Always" = 5
   b. "Often" = 4
   c. "Sometimes" = 3
   d. "Rarely" = 2
   e. "Never" = 1
2. Documentation
   Documentation is an important data collection technique involving sources such as records, books, institutional archives, official websites, news articles, and scientific journals. These serve as empirical evidence and supporting materials. In this study, the researcher analyzes school documents such as activity reports, curriculum, and administrative data, as well as relevant academic literature. Documentation also includes students' learning outcome data, such as report cards, exam results, and final semester scores obtained from official school records.
3. Interviews
   Interviews are conducted to obtain in-depth information from the principal, teachers, and students regarding factors influencing pedagogical practices and learning outcomes, as well as strategies and challenges in school leadership.

3. RESULTS AND DISCUSSION

The data description presented in this section includes data on the variables of teacher pedagogical competence (X) and student learning outcomes (Y). Based on the results of data collection conducted at SMA Muhammadiyah 3 Sidoarjo on Monday, January 12, 2026, regarding the influence of teacher pedagogical competence on mathematics learning outcomes in the composition of functions and inverse functions, the data obtained will then be processed and analyzed descriptively.

Results of Teacher Pedagogical Competence at SMA Muhammadiyah 3 Sidoarjo

The variable of teacher pedagogical competence (X) in this study was measured using a systematically designed and structured questionnaire. The questionnaire consisted of 34 items arranged based on pedagogical competence indicators, thus comprehensively representing teachers' abilities in planning, implementing, and evaluating the learning process. Each item used a Likert scale with five alternative answers, reflecting the respondent's level of agreement with the statement. On this scale, the highest score, 5, indicates an excellent or highly appropriate level of pedagogical competence, while the

lowest score, 1, indicates a very low or highly inappropriate level of competence. This score range allows researchers to measure variations in teachers' pedagogical competence levels in more detail and objectively, and provides a quantitative picture of the actual conditions in the field. Data obtained from the questionnaires were then processed using descriptive statistical analysis to determine general trends in the teacher pedagogical competence variable.

This analysis included calculating the average value (mean), the median value (median), the most frequently occurring value (mode), and measures of data distribution such as standard deviation. Through this analysis, researchers were able to identify the overall level of teachers' pedagogical competence, whether it fell into the high, medium, or low category. A summary of the results of the descriptive statistical analysis of the teacher pedagogical competence variable was then presented in tabular form for easier understanding and analysis. This tabular presentation not only facilitated data reading but also facilitated drawing more accurate conclusions regarding the condition of teachers' pedagogical competence within the context of the research. The following table shows teachers' pedagogical competencies.

Table 1. Teacher Pedagogical Competency Results

No	Teachers' Pedagogical Competence	X1	X2	Total
1	I am able to create a conducive learning environment in the classroom.	4	4	8
2	I manage learning time effectively according to the plan.	3	3	6
3	I use various teaching methods appropriate to the material.	5	4	9
4	I am able to manage the classroom well when disruptions occur.	3	4	7
5	I provide opportunities for students to actively participate in learning.	2	3	5
6	I use learning media to support the learning process.	4	4	8
7	I am able to explain the material clearly and understandably.	5	5	10
8	I adjust teaching strategies according to classroom conditions.	3	3	6
9	I am able to maintain students' attention during the learning process.	3	4	7
10	I understand the characteristics of each student.	4	5	9
11	I know students' initial ability levels before learning begins.	4	4	8
12	I pay attention to students' different learning styles.	2	3	5
13	I understand students' individual learning needs.	5	5	10
14	I am able to identify students' learning difficulties.	4	3	7
15	I pay attention to students' emotional development.	4	4	8
16	I treat all students fairly.	3	3	6
17	I understand students' social backgrounds in learning.	5	4	9
18	I prepare lesson plans (RPP) before teaching.	4	3	7
19	I formulate learning objectives clearly.	5	4	9
20	I select learning materials in accordance with the curriculum.	4	4	8
21	I design systematic learning activities.	3	3	6
22	I determine appropriate teaching methods.	5	5	10
23	I prepare learning media and resources before teaching.	4	3	7
24	I adjust lesson plans to students' conditions.	4	4	8
25	I arrange learning steps in a structured sequence.	2	3	5
26	I design learning that encourages student participation.	5	4	9
27	I develop assessment instruments according to learning objectives.	3	3	6
28	I assess students' learning outcomes objectively.	3	4	7
29	I use various assessment techniques (tests and non-tests).	4	4	8
30	I provide feedback on students' learning outcomes.	5	5	10
31	I analyze assessment results to determine student achievement.	3	3	6
32	I use evaluation results to improve learning.	5	4	9
33	I conduct continuous assessment.	4	3	7
34	I communicate assessment results to students transparently.	4	4	8

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The results of the study showed that the scores for the teacher pedagogical competency variable, namely, out of 34 statement items, were those with the highest scores, namely, statements 7, 13, 22, and 30. Meanwhile, the questions with the lowest scores were items 5, 12, and 25.

Student Learning Outcomes at SMA Muhammadiyah 3 Sidoarjo

The following student learning outcomes were obtained through the posttest. These are the results of the posttest of students at SMA Muhammadiyah 3 Sidoarjo, grade XI-IPA 1.

Table 2. Student Learning Outcomes

No	Name	Score
1.	RRZ	82
2.	FAF	65
3.	MKPW	92
4.	MNM	78
5.	MANP	58
6.	SM	85
7.	HDS	98
8.	GMT	70
9.	NA	75
10.	MZ	89
11.	AGPG	81
12.	AR	62
13.	HM	96
14.	VDR	73
15.	WN	86
16.	RD	67
17.	ASM	93
18.	FNH	74
19.	NN	88
20.	GL	80
21.	MRH	68
22.	ZAQ	95
23.	ZSR	72
24.	ATA	84
25.	RKR	60
26.	CAB	90
27.	DR	66
28.	TFP	76
29.	OEYA	83
30.	RAY	97
31.	AIM	69
32.	MHR	91
33.	APP	77
34.	RPA	82
	Jumlah	2.702
	Rata-rata	79,47

The results of the study showed that the highest score for student learning outcomes at SMA Muhammadiyah 3 Sidoarjo was 97, while the lowest score was 60, with a mean of 79.47.

Normality Test

The normality test aims to determine whether the residual data in the regression model are normally distributed. The test was conducted using the Kolmogorov–Smirnov (K-S) test using SPSS version 26.0.

Table 3. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		34
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	1.83523911
Most Extreme Differences	Absolute	.075
	Positive	.075
	Negative	-.071
Test Statistic		.075
Asymp. Sig. (2-tailed)		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

This table presents the results of the normality test for the residuals in the regression model, as indicated by the Unstandardized Residual value. Residuals are the difference between the actual values and the predicted values generated by the model, so their presence is crucial in evaluating the quality of the regression model. The residual normality test is conducted to ensure that the distribution of prediction errors follows a normal distribution. This is one of the basic assumptions in classical linear regression analysis that must be met so that the estimated regression coefficients can be considered valid, unbiased, and can be used to draw accurate conclusions.

Methodologically, the residual normality test indicates whether the regression model meets the classical assumptions. If the residuals are normally distributed, the regression model can be said to have a good level of reliability in representing the relationships between the variables under study. Conversely, if the residuals are not normally distributed, this may indicate problems with the model, such as the presence of outliers, model specification errors, or data distribution that does not conform to the linear regression assumptions. Therefore, the normality test serves not only as a statistical formality but also as a diagnostic tool to assess the overall feasibility of the model.

The basis for decision-making in this normality test is the significance value (Sig.), obtained either through Asymp. Sig. or Monte Carlo Sig. If the Sig. value is greater than 0.05, then the null hypothesis (H_0) is accepted, indicating that the residual data are normally distributed and the normality assumption is met. Conversely, if the Sig. value is less than or equal to 0.05, then H_0 is rejected, indicating that the residuals are not normally distributed. This decision serves as an important basis for determining whether the regression analysis can proceed to the interpretation stage or whether model improvements are necessary, such as data transformation or the use of alternative analysis methods. Based on the results of the One-Sample Kolmogorov-Smirnov normality test, the Asymp. Sig. (2-tailed) is known to be

0.200. Since the significance value of 0.200 > 0.05, it can be concluded that the data are normally distributed. The second prerequisite test, the homogeneity test, is then performed.

Homogeneity Test

The homogeneity test is used to test whether two variances are equal. To evaluate the similarity of variation between two data groups (control and experimental groups). If the significance value is >0.05, the data distribution is homogeneous. Conversely, if the significance value is <0.05, the data distribution is not homogeneous.

Table 4. Homogeneity Test Results

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Learning outcomes	Based on Mean	.319	5	28	.897
	Based on Median	.306	5	28	.905
	Based on median and with adjusted df	.306	5	25.451	.905
	Based on trimmed mean	.319	5	28	.897

Based on the results of the homogeneity test above, the significance value was 0.897. Therefore, it can be concluded that a significance value of 0.897 > 0.05 indicates a homogeneous data distribution. The third prerequisite test, the Pearson correlation test, was then performed.

Pearson Correlation Test

The Pearson correlation test measures the closeness of a linear relationship between two variables with a normal data distribution. The significance value between x and y is determined using the r table criterion at a significance level (2-tailed) of 0.05. If the value is positive and r count ≤ r table, there is a significant relationship between variables x and y. If r count ≥ r table, there is no significant relationship between variables x and y.

Table 5. Pearson Correlation Test Results

Correlations

			Teacher Pedagogical Competence	Learning outcomes
Teacher Competence	Pedagogical	Pearson Correlation	1	.987**
		Sig. (2-tailed)		.000
		N	34	34
Learning outcomes		Pearson Correlation	.987**	1
		Sig. (2-tailed)	.000	
		N	34	34

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the table above, the significance value for the correlation between teacher pedagogical competence and learning outcomes is 0.000. The basis for decision-making is that if the significance value is <0.05, then the two variables are correlated. Both variables have a significance value of 0.000, which is less than the 0.05 level. Based on the table

above, the calculated r value is 0.987 > r table value of 0.339. It can be concluded that there is a significant relationship between teacher pedagogical competence and learning outcomes. The calculated r value represents a positive number, meaning that the relationship between pedagogical competence and learning outcomes is one-way, and as teacher pedagogical competence increases, learning outcomes also improve. The r value, or Pearson correlation value of 0.987, indicates a very strong/very strong relationship. Therefore, the fourth prerequisite test, a simple linear regression test, was conducted.

Simple Linear Regression Test

Simple linear regression analysis is a statistical technique used to examine and measure the functional relationship between two variables: the independent variable and the dependent variable. In the context of this research, the analysis aims to determine the extent to which teachers' pedagogical competence, as the independent variable, influences student learning outcomes, as the dependent variable. Through this analysis, researchers can not only determine whether there is a relationship between the two variables but also determine the direction of the relationship (positive or negative) and the magnitude of the resulting influence. In other words, simple linear regression allows researchers to predict changes in student learning outcomes based on the level of teachers' pedagogical competence. The higher a teacher's pedagogical competence, which includes the ability to design learning, implement effective learning processes, and conduct evaluations, the higher the expected student learning outcomes.

Furthermore, this analysis also provides a quantitative overview of the contribution of teachers' pedagogical competence in explaining variations in student learning outcomes. Thus, the results of the simple linear regression analysis are not only descriptive but also inferential, and can serve as a basis for decision-making and the formulation of educational policies oriented towards improving the quality of learning. The following are the results of the simple linear regression test.

Table 6. Simple Linear Regression Test

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4113.323	1	4113.323	1184.250	.000[b]
	Residual	111.147	20	3.473		
	Total	4224.471	33			

a. Dependent Variable: Learning outcomes
b. Predictors: (Constant), Teacher Pedagogical Competence

Based on the coefficients table above, the following simple linear regression equation is obtained:

$$Y = a + bX$$

$$Y = 4113{,}323 + 111{,}147X$$

Description:
Y: Teacher Pedagogical Competence
a: Constant
b: Regression Coefficient
X: Learning Outcomes

The results of the regression equation above can be interpreted as follows:

a. α is a constant from the unstandardized coefficients. In the table above, the constant value is 4113.323. This means that if the value of the independent variable (teacher pedagogical competence) = 0 (zero), then the value of the dependent variable (teacher pedagogical competence) will show a level of 4113.323. In other words, if there is no teacher pedagogical competence (X), then student learning outcomes (Y) will be 4113.323.

b. b is the regression coefficient. The value in the table is 111.147, which means that for every 1% increase in teacher pedagogical competence (X), student learning outcomes (Y) will increase by 111.147. Since the regression coefficient is positive, it can be concluded that teacher pedagogical competence (X) has a positive effect on student learning outcomes (Y). This means that if teacher pedagogical competence increases, student learning outcomes will also increase. The next step is to test the hypothesis.

Hypotheses formulated in the initial research stage cannot be immediately assumed to be correct; they must undergo a scientific testing process to ensure their validity. Hypothesis testing is conducted using empirical data collected through various data collection techniques, such as questionnaires, observation, and documentation. This process aims to provide an objective basis for concluding, ensuring that research results are not merely assumptions but are supported by academically sound evidence.

A hypothesis is accepted if the data analysis shows a significant correspondence or relationship with the hypothesis. Conversely, a hypothesis is rejected if the data obtained does not provide adequate support or even contradicts the researcher's initial assumptions. Therefore, hypothesis testing is a crucial stage in research. This process allows researchers to determine whether the tentative assumptions formulated are truly relevant to actual conditions in the field, and also serves as the basis for formulating research conclusions and recommendations. The F test and the t test were used in hypothesis testing. The following are the results of the F and t tests with a significance level of 0.05.

The F test is used to simultaneously test whether or not the independent variable influences the dependent variable. The guideline is that if the sig value is <0.05, there is an influence of variable X on variable Y. Conversely, if the sig value is >0.05, there is no influence of variable X on variable Y. The following are the results of the F test.

Table 7. F Test Results

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4113.323	1	4113.323	1184.250	.000[b]
	Residual	111.147	20	3.473		
	Total	4224.471	33			

a. Dependent Variable: Learning Outcomes
b. Predictors: (Constant), Teacher Pedagogical Competence

Based on the results of Table 7 above, the significance value is 0.000 < 0.05, and the calculated F value is 1184.250. Therefore, the calculated F > F (1184.250 > 4.15). Therefore, from the above analysis, it can be concluded that the independent variable, teacher pedagogical competence (X), has a significant effect on the dependent variable, student

learning outcomes (Y). In other words, H1 is accepted, meaning that the independent variable, teacher pedagogical competence, affects the dependent variable, student learning outcomes at SMA Muhammadiyah 3 Sidoarjo.

The t-test is used to test whether or not the indicators of teacher pedagogical competence (X) affect student learning outcomes (Y). The guidelines used are: if the sig value is < 0.05 or the calculated t value is > t table, then there is an effect of variable X on variable Y. Conversely, if the sig value is > 0.05 or the calculated t value is < t table, then there is no effect of variable X on variable Y. The following are the results of the t-test.

Table 8. t-Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	22.986	1.672		13.746	.000
	Teacher Pedagogical Competence	7.444	.216	.987	34.413	.000

a. Dependent Variable: Learning Outcomes

Based on the results of the t-test output in the table above, the significant value is 0.000 < 0.05, and the t_{count} value is 13.746, so $t_{count} > t_{table}$ (13.746 > 2.037). Based on the results of the t-test decision, it shows that there is a significant influence of teacher pedagogical competence on student learning outcomes at SMA Muhammadiyah 3 Sidoarjo.

Discussion

Based on the results of research conducted at Muhammadiyah 3 Senior High School in Sidoarjo, it was found that teachers' pedagogical competence has a very significant relationship and influence on student learning outcomes in mathematics, particularly in the composition of functions and inverse functions. This is evident from the results of the descriptive and inferential analyses conducted. Descriptively, teachers' pedagogical competence is in the fairly good category. This is indicated by the questionnaire scores obtained from 34 statements reflecting teachers' abilities in planning, implementing, and evaluating learning. Several indicators with the highest scores, such as the ability to explain material clearly, understand students' learning needs, determine appropriate learning methods, and provide feedback on learning outcomes, indicate that teachers have strong core competencies in the learning process. However, several aspects still scored low, such as providing opportunities for students to be active, understanding students' learning styles, and developing a coherent learning process. This indicates that although pedagogical competence is generally good, improvements are still needed, especially in student-centered learning [22].

In terms of student learning outcomes, the average score was 79.47, indicating that overall learning outcomes were in the fairly good category. The wide range of scores between the lowest and highest scores indicates variation in student abilities. This variation can be influenced by various factors, one of which is teachers' pedagogical competence in managing learning [23]. Teachers who are able to adapt learning strategies to students' needs

tend to improve student understanding and learning outcomes more evenly. The results of the prerequisite analysis test indicate that the research data meet the classical assumptions. The normality test indicates that the data are normally distributed with a significance value of 0.200 > 0.05, while the homogeneity test indicates that the data have homogeneous variance with a significance value of 0.897 > 0.05. With these two assumptions met, further analysis can be validly conducted using correlation and regression tests. The Pearson correlation test results indicate that both variables have a significance level of 0.000, less than the 0.05 level. Based on the table above, it is known that r count is 0.987 > r table 0.339 and r value or Pearson correlation is 0.987. This value indicates a very strong and positive relationship between teacher pedagogical competence and student learning outcomes. This means that the higher the teacher's pedagogical competence, the higher the student learning outcomes. This very strong relationship indicates that pedagogical competence is one of the dominant factors influencing student learning success. Furthermore, the results of a simple linear regression analysis show that teacher pedagogical competence has a significant effect on student learning outcomes. This is reinforced by the results of the F test, which shows a significance value of 0.000 <0.05, and the F count value is 1184.250. So F count > F table (1184.250 > 4.15). Furthermore, the t-test results also indicate that teacher pedagogical competence has a partial effect on student learning outcomes, with a significance value of 0.000 < 0.05, resulting in a t-test of 13.746, thus t-test > t-table (13.746 > 2.037). The positive regression coefficient indicates that any increase in teacher pedagogical competence will be followed by an increase in student learning outcomes [24].

This finding aligns with the theory that pedagogical competence is one of the key competencies a teacher must possess to create effective learning [25]. Teachers with strong pedagogical competence will be able to understand student characteristics, design appropriate learning, and conduct appropriate evaluations, thereby improving the quality of student learning outcomes. Therefore, it can be concluded that teacher pedagogical competence plays a crucial role in improving student learning outcomes. Therefore, efforts to improve teacher pedagogical competence need to be continuously undertaken through various programs such as training, workshops, and ongoing professional development. Furthermore, teachers also need to continually reflect on their learning practices to adapt them to student needs and characteristics.

4. CONCLUSION

This study confirms that teacher pedagogical competence plays a fundamental role in supporting the quality of mathematics learning at the senior high school level. Effective pedagogical practices contribute to the creation of a learning environment that facilitates student understanding, engagement, and academic development. The findings indicate that the way teachers plan, implement, and evaluate learning activities is closely associated with students' ability to achieve expected learning outcomes. From a practical perspective, the study highlights the importance of continuous professional development programs aimed at strengthening teachers' pedagogical skills. Schools and educational stakeholders should prioritize initiatives that enhance instructional strategies, student-centered learning approaches, classroom management, and assessment practices. Improving these

competencies may contribute to better learning experiences and academic achievement among students.

This research is limited to a single educational institution and focuses only on the influence of pedagogical competence on mathematics learning outcomes. Therefore, the findings may not fully represent conditions in different schools, educational levels, or subject areas. In addition, other factors that may affect student achievement, such as learning motivation, parental support, socioeconomic background, learning facilities, and teaching experience, were not examined in this study. Future studies are recommended to involve larger and more diverse samples from different regions and school contexts to improve the generalizability of findings. Researchers may also investigate additional variables that interact with pedagogical competence, including student motivation, digital learning readiness, classroom climate, and teacher professional development. Employing mixed-methods or longitudinal approaches could provide a more comprehensive understanding of how pedagogical competence influences learning outcomes over time.

The contribution of this study lies in providing empirical evidence regarding the importance of pedagogical competence in the educational process. The findings may serve as a reference for educators, school administrators, policymakers, and teacher-training institutions in designing strategies to improve teaching quality. For the broader community, this research reinforces the significance of competent teachers in supporting students' academic success and promoting the overall quality of education.

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