

The Effect of Teacher Performance on Student Learning Outcomes in Mathematics

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ABSTRACT

This study examines the effect of teacher performance on student learning outcomes in mathematics using quantitative and qualitative methods. Quantitatively, linear regression analysis revealed a strong positive correlation, with a regression coefficient of 0.563, meaning each unit increase in teacher performance led to a 0.563 unit improvement in student outcomes. The coefficient of determination ($R^2 = 0.276$) indicated that 27.6% of the variance in student achievement was explained by teacher performance, while other unexamined factors affected 72.4%. A T-test supported these findings, with a significance level of 0.01 (below the 0.05 threshold) and a t-value of 2.724, exceeding the critical value of 2.005, confirming statistical significance. These results affirm that teacher performance significantly impacts students' mathematical achievement. However, the relatively low R^2 suggests that other variables—such as curriculum quality, student motivation, parental involvement, or classroom environment—play essential roles. Qualitatively, the study underscores the need for further research to explore broader determinants of educational success and strategies to enhance teacher performance. By integrating both methods, the study provides a comprehensive understanding of how teacher quality shapes student learning and highlights the complexity of educational outcomes that extend beyond teacher-related factors.

ARTICLE INFORMATION

Keywords:

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INTRODUCTION

Education is a fundamental pillar in developing individuals and societies, playing a pivotal role in shaping the future workforce and fostering social cohesion. It is often discussed among experts, with a primary focus on the quality of education, student outcomes, curriculum design, and the critical role of teachers in this dynamic. While education is universally recognized as crucial, its implementation often does not fully align with the expectations set by society. This challenge is particularly pronounced in Indonesia, as the education system is segmented into several stages, including early childhood education, primary education, secondary education, and higher education. Among these, vocational high schools are essential in preparing students to be skilled and ready to enter the workforce. However, the results of national assessments indicate that many students, particularly those in vocational tracks, are not meeting the Minimum Graduation Criteria, particularly in mathematics (Sari & Gita, 2020). This presents a significant concern for educators and policymakers alike.

As a core subject, mathematics is integral to developing students' critical thinking and problem-solving skills. Despite its importance, student performance in mathematics often remains below expected standards in many schools, especially in vocational settings. According to research, teacher performance profoundly affects student outcomes in mathematics. Teacher performance is defined as the ability of an educator to plan, implement, and evaluate the learning process in alignment with predetermined standards and objectives (Asterina & Sukoco, 2019). In this regard, teacher

performance does not solely refer to inherent qualities such as intelligence or talent, but rather to the measurable effect of these qualities on student learning. It encompasses the planning of lessons, the delivery of content, and the assessment of student understanding, all of which contribute to shaping the quality of learning outcomes (Madjid, 2016).

Effective teacher performance is a key factor in determining the quality of education, and it has been shown to affect student learning outcomes directly. Novita et al. (2019) emphasize that teacher effectiveness significantly impacts how students absorb and apply knowledge, particularly in subjects requiring analytical and reasoning skills, such as mathematics. In vocational education, teacher performance becomes even more critical, as students must not only grasp theoretical knowledge but also develop practical skills that are directly applicable in the workforce. Therefore, assessing teachers' performance, especially regarding their ability to engage students and promote understanding in complex subjects like mathematics, is crucial for improving educational outcomes in vocational high schools (Zahra, 2020).

Teacher performance is typically measured using various criteria, including lesson planning, teaching strategies, classroom management, and the ability to assess and respond to student needs. Research has shown that teachers who consistently employ best practices in these areas are more likely to produce positive learning outcomes (Hamid & Hartini, 2018). For example, active learning strategies and differentiated instruction can significantly enhance student engagement and mastery of mathematical concepts (Nasution & Abdullah, 2017). Moreover, ongoing professional development for teachers is essential to stay up-to-date with the latest teaching methodologies and subject knowledge. According to Asterina and Sukoco (2019), professional development programs have been linked to improvements in teacher performance and, consequently, student learning outcomes.

The connection between teacher performance and student learning outcomes is particularly evident in schools where teachers actively engage in reflective practices and adapt their teaching methods based on student feedback and performance. Setiawan and Nugraha (2020) highlighted that more reflective teachers could identify students' learning difficulties more effectively and tailor their teaching methods to address these challenges. This adaptability is crucial in vocational education, where students may have diverse learning needs and varying levels of prior knowledge. As such, teacher performance should be viewed in terms of the immediate outcomes of student assessments and their long-term effect on student motivation, confidence, and skills development.

Furthermore, the role of teachers in fostering a positive learning environment cannot be understated. Ismail et al. (2019) found that teacher enthusiasm and a supportive classroom atmosphere were key factors in improving student outcomes in mathematics. Teachers who can motivate their students and create an environment conducive to learning are more likely to see improvements in student performance. This is particularly important in vocational education, where students may have less intrinsic interest in academic subjects like mathematics, which they might perceive as irrelevant to their vocational training.

The effect of teacher performance on student outcomes is affected not only by internal factors, such as teacher competence and teaching methods, but also by external factors such as school infrastructure, access to resources, and parental involvement. Sari and Gita (2021) show that schools with adequate resources and robust support systems are better positioned to implement effective teaching practices, leading to improved student performance. Their study emphasized that strong infrastructure and sufficient educational resources are key to fostering an environment conducive to learning and improving outcomes. Furthermore, the active involvement of parents in the educational process contributes significantly to students' academic achievements, as it reinforces the efforts made by teachers in the classroom. Similarly, Hamid and Hartini (2018) suggest that teacher professional

development programs supported by adequate resources and organizational commitment lead to better teaching practices and, consequently, improved student outcomes.

However, even in resource-constrained environments, teacher performance remains critical in determining student success. According to [Setiawan and Nugraha \(2020\)](#), teachers who demonstrate dedication, adaptability, and creativity in their teaching practices can still improve student outcomes. This highlights that, despite limited resources, teachers committed to professional growth and innovation can overcome obstacles and effectively support student learning. As they adapt their strategies to meet the needs of diverse learners, teachers can create an engaging and productive learning environment, ultimately leading to better academic performance among students, even in less-than-ideal circumstances. Furthermore, [Asterina and Sukoco \(2019\)](#) underscore that while external factors play a role, teachers' commitment and pedagogical skills are pivotal in shaping student performance in high- and low-resource settings.

In conclusion, teachers' performance plays a central role in determining students' academic success, particularly in mathematics, which is a core subject in vocational high schools. Teacher performance correlates directly with student learning outcomes as measured by the learning planning, implementation, and evaluation. Effective teaching strategies, professional development, reflective practice, and creating a positive learning environment are all essential components of teacher performance that contribute to improved student achievement. To address the challenges faced by vocational education in Indonesia, it is crucial to continue investing in teacher training and support to ensure that teachers are equipped to meet their students' diverse needs and help them achieve their full potential. This study aims to determine how much teacher performance affects student learning outcomes in mathematics lessons. In addition, it is also to determine the quality of teachers in forming or creating good learning for students in improving learning outcomes.

METHOD

This study utilizes a mixed-methods approach, combining quantitative and qualitative techniques to examine the relationship between teacher performance and student learning outcomes. The quantitative aspect of the research employs a descriptive design and correlational method to assess how teacher performance affects various aspects of student outcomes. According to [Nugroho \(2018\)](#), the correlation method is valuable for evaluating the strength and direction of the relationship between variables, offering a clear statistical understanding of how one factor may affect another.

This research aims to analyze the extent to which teacher performance affects the learning outcomes of students in high school. Data collection occurred from January 2024 to July 2024, focusing on the tenth and seventh grade students in the 2023/2024 academic year. By targeting this group, the study seeks to understand the effect of teacher performance on different cohorts at the secondary education level, thereby addressing gaps in prior research on teacher effectiveness and student achievement in Indonesia.

The operational definitions of the variables in this study are crucial for understanding the scope and measurement techniques used. Teacher performance is defined based on various aspects of teaching, including the preparation of lesson plans, mastery of material, selection of teaching methods, classroom management, and evaluation techniques ([Supardi, 2014](#)). On the other hand, learning outcomes are assessed by observing changes in students' cognitive, affective, and psychomotor domains ([Moore, 2014](#)). These domains indicate comprehensive student development, moving beyond academic grades to emotional and behavioral growth.

This study employs quantitative and qualitative data collection methods to explore the relationship between teacher performance and student learning outcomes. The quantitative data was collected through surveys and assessments to evaluate teacher performance and student outcomes.

They were analyzed using statistical techniques such as validity and reliability tests, simple regression analysis, determination coefficients, correlation analysis, and hypothesis testing. These analyses thoroughly examined how teacher performance correlates with student outcomes across various academic areas. As highlighted by Miles (2014) in *Qualitative Data Analysis*, statistical methods such as the determination coefficient help quantify the effect of teacher performance on student learning. This analysis provides a clear picture of how teacher performance affects learning outcomes and the extent to which variations in teacher effectiveness can account for differences in student success.

In addition to these quantitative methods, qualitative data were integrated to better understand the contextual factors that drive the observed relationships. Qualitative techniques, such as interviews with teachers and focus group discussions with students, provide valuable insights into the specific aspects of teacher performance, such as classroom management, student engagement, and teaching strategies. Norman K. Denzin's work in *The Research Act* (1970) emphasizes that qualitative methods offer deeper insights into the participants' lived experiences, helping to explain the mechanisms behind the statistical patterns found in quantitative analysis.

Furthermore, qualitative data can reveal how factors like teacher-student interaction and motivational strategies contribute to learning outcomes, areas not easily captured through quantitative data alone. As Herdiansyah (2010) discussed, this approach emphasizes the need for triangulation between qualitative and quantitative data to understand the research problem comprehensively.

Two additional studies, indexed in Scopus, further support the value of integrating both data types to understand the effect of teacher performance on student outcomes. Dorman (2012) emphasizes the importance of teacher and student perspectives in explaining learning outcomes, stating that "teacher performance and student perceptions significantly affect academic achievement." This aligns with the qualitative approach of collecting subjective experiences to understand how teacher behaviors directly affect student learning.

Talan and Kozub (2014) suggest that the combination of objective performance measures (such as test scores) and subjective assessments (like interviews with teachers and students) allows researchers to obtain a more nuanced view of the factors influencing educational outcomes. Their findings highlight the interaction between teacher performance and student motivation, further supporting the inclusion of qualitative data to complement quantitative findings. In conclusion, combining quantitative and qualitative data collection methods ensures that this study captures a more holistic view of how teacher performance affects student learning outcomes, addressing both measurable factors and the underlying perceptions and experiences of the involved parties. This approach enriches the findings and provides practical insights for improving teacher performance and educational practices.

Integrating quantitative and qualitative data through triangulation allows for a more comprehensive research problem analysis. Triangulation helps to cross-verify findings from different data sources, increasing the credibility and validity of the results. The quantitative findings will provide a broad statistical overview of the relationships between teacher performance and student learning outcomes, while the qualitative data will offer a more nuanced understanding of how these relationships manifest in real classroom settings.

This mixed-methods approach provides statistical evidence and rich contextual data on the effect of teacher performance on student learning outcomes. The findings offer valuable insights for educators, policymakers, and stakeholders in the education sector, especially in enhancing teacher professional development programs. By understanding the statistical significance and the real implications of teacher performance, the study aims to improve educational quality and student achievement.

RESULTS AND DISCUSSION

The results of the validity test of the research variable "Teacher Performance (X)" are presented in full in Table 1. This table displays the validity coefficient for each indicator used to measure teacher performance. Based on the established validity criteria, each item was statistically tested to ensure that it accurately reflects the underlying construct. The data in Table 1 provide empirical evidence that the measurement instrument meets the required validity standards, thus confirming the eligibility of each indicator to be included in further analysis.

Table 1. Validity Test of Teacher Performance (X)

Statement	Value R_{table}	Value $R_{calculated}$	Value Sig	Value Sig Test Result	Description
X.1	0.2632	0.394	0.05	<0.003	Valid
X.2	0.2632	0.606	0.05	<0.001	Valid
X.3	0.2632	0.465	0.05	<0.001	Valid
X.4	0.2632	0.616	0.05	<0.001	Valid
X.5	0.2632	0.577	0.05	<0.001	Valid
X.6	0.2632	0.378	0.05	<0.001	Valid
X.7	0.2632	0.459	0.05	<0.001	Valid
X.8	0.2632	0.631	0.05	<0.001	Valid
X.9	0.2632	0.812	0.05	<0.001	Valid
X.10	0.2632	0.660	0.05	<0.001	Valid
X.11	0.2632	0.514	0.05	<0.001	Valid
X.12	0.2632	0.574	0.05	<0.001	Valid

Source: Primary data processed with SPSS 29, 2024

Table 1 shows the values generated from the validity test of various statements (X.1 to X.12). The parameter used is the r table value (0.2632), the minimum limit for the validity of an instrument. The instrument is considered valid if the calculated r is greater than the r table. The calculated r value is the value calculated from the collected data. The statement is valid if this value is greater than the r table. The sig value indicates the significance of the test results. A Sig value <0.05 indicates that the results are significant. All statements (X.1 to X.12) have a calculated r value higher than the r table (0.2632) and a Sig value less than 0.003 to 0.001. Since all statements meet these two criteria, all statements are valid.

The validity testing conducted in this study demonstrates that the instruments used to measure teacher performance and student learning outcomes are statistically valid. Specifically, each item within the instruments yielded a calculated r -value exceeding the critical r -table value of 0.2632, with all associated p -values falling below the 0.05 significance threshold. These results indicate a statistically significant correlation, affirming that each item reliably contributes to measuring the intended construct. Such outcomes substantiate the instruments' robustness, ensuring their appropriateness for use in empirical educational research.

From a quantitative perspective, these findings underscore the measurement tools' internal consistency and construct validity. The high correlation coefficients and statistical significance observed suggest that the instruments exhibit reliability and can accurately capture the variations in teacher effectiveness and student achievement. This aligns well with established standards in quantitative methodology, where instrument validation is critical to ensuring the credibility of subsequent data analysis and interpretation. The observed validity aligns with previous research in the domain of educational assessment. [Setiawan and Nugraha \(2020\)](#) highlighted the importance of using instruments with a Cronbach's Alpha above 0.80 to achieve a reliable evaluation of educational

parameters such as teaching performance. Similarly, Zawawi (2021) confirmed a strong linkage between validated measurement tools and observed performance indicators, reinforcing the assertion that well-designed instruments yield more accurate and generalizable findings.

However, while these findings affirm the statistical soundness of the instruments, a deeper contextual analysis is warranted to enrich the interpretation further. Specifically, acknowledging the cultural, institutional, and socio-economic diversity across educational environments may uncover nuanced insights into how validity manifests in different contexts. For instance, an instrument deemed valid in one socio-cultural setting might exhibit different levels of relevance or interpretability in another, thus underscoring the importance of context-sensitive validation approaches. As such, future research should consider integrating cross-cultural validity checks and contextual sensitivity analyses to ensure the broad applicability of educational assessment instruments across varied learning ecosystems.

Meanwhile, Table 2 presents the validity test results for the Student Learning Outcome (Y) variable. This table systematically displays the correlation values between each item and the total score, which serves as evidence of the instrument's construct validity. All items were subjected to rigorous statistical analysis to determine their relevance and accuracy in measuring student learning outcomes. The results show that each indicator meets the validity threshold, indicating a strong and significant relationship with the overall construct. Therefore, the data in Table 2 confirms that the instrument used is valid and suitable for measuring the Student Learning Outcome (Y) variable in further analysis.

Table 2. Validity Test of Student Learning Outcomes (Y)

Statement	Value r_{table}	Value $r_{\text{calculated}}$	Value Sig	Value Sig Test Result	Description
Y.1	0.2632	0.409	0.05	<0.002	Valid
Y.2	0.2632	0.497	0.05	<0.001	Valid
Y.3	0.2632	0.645	0.05	<0.001	Valid
Y.4	0.2632	0.682	0.05	<0.001	Valid
Y.5	0.2632	0.586	0.05	<0.001	Valid
Y.6	0.2632	0.743	0.05	<0.001	Valid
Y.7	0.2632	0.631	0.05	<0.001	Valid
Y.8	0.2632	0.618	0.05	<0.001	Valid
Y.9	0.2632	0.787	0.05	<0.001	Valid
Y.10	0.2632	0.788	0.05	<0.001	Valid
Y.11	0.2632	0.685	0.05	<0.001	Valid

Source: Primary data processed with SPSS 29, 2024

Table 2 shows that all statements are valid with $r_{\text{count}} > r_{\text{table}}$. It can be concluded that all statement items from the student learning outcomes (Y) are suitable for use because they have an r_{count} value > 0.2632 , so that the instrument used is suitable for further analysis. Table 3 displays the reliability test results conducted on all research variables. This table provides the Cronbach's Alpha values for each construct, which indicate internal consistency among the measurement items. A reliability coefficient greater than 0.70 is generally considered acceptable, indicating that the items reliably measure the same underlying concept. As shown in Table 3, all variables meet or exceed the minimum reliability threshold, confirming that the instrument demonstrates high consistency and dependability. These findings validate the use of the instrument for further statistical analysis and hypothesis testing within the study.

Table 3. Variable Reliability Test

Research Variables	Value Cronbach's Alpha	Number of Items
Teacher Performance (X)	0.814	12
Student Learning Outcomes (Y)	0.863	11

Source: Primary data processed with SPSS 29, 2024

Table 3 shows the Cronbach's Alpha value of each variable. The Teacher Performance variable (X) value is 0.814, where $0.814 > 0.60$, so the data is reliable. The Student Learning Outcome variable (Y) value is 0.863, where $0.863 > 0.60$, so the data is reliable. Overall, these research variables show good reliability, which means that the instruments used to collect data on both variables consistently measure what should be measured. The reliability test results, as shown in Table 3, demonstrate strong internal consistency for both research variables. Specifically, the Cronbach's Alpha value for the *Teacher Performance* variable is 0.814, while the *Student Learning Outcomes* variable yields a value of 0.863. These values exceed the commonly accepted threshold of 0.80, which, according to psychometric standards, indicates a high level of instrument reliability. Such findings confirm that the items within each construct are cohesively interrelated and consistently measure the intended dimensions of performance and outcomes.

From a quantitative perspective, these reliability scores provide compelling evidence that both instruments are statistically sound and suitable for further inferential analysis, including regression and structural equation modeling. The strong internal consistency ensures that any observed relationships between teacher performance and student learning outcomes are not compromised by measurement errors or inconsistencies within the data collection tools. This observation is in line with previous empirical findings. Almukhtar et al. (2019) emphasized that instruments with Cronbach's Alpha values exceeding 0.80 indicate strong psychometric robustness, especially when applied in the context of educational assessment. Similarly, Saputra (2019) reported comparable reliability results in a study focusing on teacher effectiveness and student performance, strengthening the validity of using high alpha instruments in educational settings.

Beyond the statistical validation, it is important to consider a complementary qualitative dimension. While numerical indicators confirm the instrument's consistency, further investigation into teacher perceptions could uncover critical insights about how accurately these tools capture the realities of classroom practice. For instance, teachers might be asked whether the survey items reflect their daily responsibilities and challenges. Exploring such perspectives would enhance the contextual validity of the instrument and ensure that the tool functions well statistically and resonates meaningfully with its intended users. The reliability test results affirm that the instruments employed in this study are both statistically and contextually robust. However, incorporating qualitative feedback could strengthen the instrument's applicability and relevance in real-world educational environments. The simple linear regression analysis results, which revealed a statistically significant relationship between teacher performance and student learning outcomes, can be seen in Table 4.

Table 4. Simple Linear Regression Test

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
1 (Constant)	15.765	5.787		2.724	.009
Teacher Performance	.563	.124	.526	4.541	<.001

a. Dependent Variable: Learning outcomes

Source: Primary data processed with SPSS 29, 2024

The regression analysis yields compelling evidence of a strong, positive, and statistically significant relationship between *teacher performance* and *student learning outcomes*, as indicated by a regression coefficient of 0.563, a t-value of 4.541, and a p-value of <0.001. These values signify that improvements in teacher performance have a measurable and substantial effect on student academic achievement. Specifically, for each unit increase in teacher performance, student outcomes are predicted to rise by 0.563 units, underscoring the critical role of educators in shaping learning trajectories.

The statistical robustness of this relationship is demonstrated by the highly significant p-value and strong coefficient, reinforcing the theoretical assumption that teacher performance is not only correlated with, but actively drives, student success. This strengthens the predictive validity of the instrument and confirms that teacher-centered variables are central to outcomes-based education reform. The strength of the t-value (4.541) further confirms the reliability and significance of this effect in the sample population. These findings align with previous research that emphasizes the pivotal role of teacher effectiveness in improving learning outcomes. Ningsih (2021) found that teacher performance significantly affects student achievement across multiple academic domains, suggesting that the effect of pedagogical practices transcends subject-specific contexts. Similarly, Amaliah (2023) demonstrated that enhanced instructional quality led to measurable improvements in national exam scores, particularly in schools implementing continuous teacher training programs. These studies conclude that teacher performance is one of the most critical determinants of educational success. Regression analysis shows that teacher performance significantly predicts student learning outcomes. This finding is not only statistically significant but also educationally meaningful, providing a strong justification for investment in teacher capacity development. As the education sector moves toward evidence-based reform, these empirical insights should inform strategic planning and resource prioritization to ensure that improvements in teaching quality directly translate into improvements in student achievement.

Based on Table 4 with the comparison formula $t_{table} = t(\alpha/2; n-k-1) = t(0.025; 54) = 2.005$, the regression equation and coefficient of the Teacher Performance variable can be seen. The partial regression model can be interpreted as follows: 1) Based on Table 4, the constant value is 2.724. Without the Teacher Performance variable, Student Learning Outcomes will be 2.724; 2) Based on Table 4, it can be seen that the regression coefficient of the Teacher Performance variable is 4.541. Therefore, the results of the statistical test (t_{count}) are greater than the t_{table} value ($4.541 > 2.005$), then H_0 is rejected and H_a is accepted at a significance level of $0.01 < 0.05$. This means the Teacher Performance variable positively and significantly affects Student Learning Outcomes.

The results of the hypothesis testing demonstrate a statistically significant relationship between teacher performance and student learning outcomes. The t-statistic ($t = 4.541$) exceeds the critical value from the t-distribution table ($t_\alpha = 2.005$, $\alpha = 0.05$), leading to the rejection of the null hypothesis (H_0) and the acceptance of the alternative hypothesis (H_a). This confirms that teacher performance is not only associated with, but significantly predictive of, variations in students' academic achievement. This empirical evidence reinforces the theory that teacher effectiveness is a fundamental determinant of learning outcomes. The strength of the regression model, as indicated by the significance level, enhances the credibility of the quantitative inference and supports the construct causal pathway's validity. The findings are consistent with prior studies in the field. For instance, Yuliana (2020) found a statistically significant and positive correlation between teacher performance and student academic success using t-test methodology, thereby corroborating the current analysis results and affirming the replicability of this relationship across different educational settings.

However, quantitative metrics alone may not fully capture this relationship's complex dynamics. Integrating qualitative insights through semi-structured interviews or focus group

discussions with teachers and students would enable a deeper exploration of the contextual and perceptual factors that mediate teacher effectiveness. Such a mixed-methods approach would enrich the interpretive depth of the research, providing a more holistic understanding of how and why teacher performance translates into improved learning outcomes within the studied context. Table 5 presents the correlation test results, illustrating a strong, positive, and statistically significant relationship between *teacher performance* and *student learning outcomes*. The correlation coefficient indicates a direct and robust association, where higher teacher performance is reliably linked to improved student academic achievement.

Table 5. Correlation Test Results

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.526 ^a	.276	.263	5.432
a. Predictors: (Constant), Teacher Performance				
b. Dependent Variable: Learning outcomes				

Source: Primary data processed with SPSS 29, 2024

Based on Table 5, the value (r) is 0.526 or 52.6%. It can be interpreted that the value (r) is 0.526 or 52.6%. This result shows a moderate correlation coefficient between teacher performance variables (X) and student learning outcomes (Y). The computed correlation coefficient ($r = 0.526$) reveals a moderate, yet statistically relevant, association between teacher performance and student learning outcomes. This degree of correlation suggests that although teacher performance contributes meaningfully to students' academic success, it does not account for most observed variation. The coefficient of determination ($R^2 = 0.276$) further quantifies this relationship, indicating that approximately 27.6% of the variance in student learning outcomes can be explained by the quality of teacher performance. In comparison, the remaining 72.4% is likely attributable to a combination of extraneous variables beyond the scope of this model.

From a quantitative standpoint, this result affirms the hypothesis that teacher effectiveness is a salient factor in influencing learning achievement, yet it also underscores the multifactorial nature of educational attainment. Learning outcomes are seldom the product of a single effect; instead, they emerge from a complex interplay of pedagogical, environmental, psychological, and socio-economic dimensions. These findings are consistent with the empirical patterns observed in prior studies, such as Sutrisno (2021), which reported R^2 values ranging from 0.25 to 0.30 when examining similar constructs. The convergence of results across studies strengthens the generalizability of the conclusion that, while teacher performance is a significant input variable, it operates within a broader constellation of determinants.

To develop a more comprehensive explanatory model, future investigations should consider the integration of qualitative methodologies. Factors such as students' intrinsic motivation, classroom climate, institutional support structures, and parental engagement could account for the unexplained variance identified in this analysis. Qualitative data derived from interviews or focus group discussions would contextualize the statistical outcomes and provide interpretive insights into the dynamics underlying effective teaching and learning processes. Table 6 presents the results of the determination coefficient (R^2) test, which assesses the proportion of variance in *student learning outcomes* that can be explained by *teacher performance*. The R^2 value indicates the explanatory power of the regression model, revealing how much of the variation in student achievement is accounted for by changes in teacher performance.

Table 6. Results of Determination Coefficient Test

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.526 ^a	.276	.263	5.432

a. Predictors: (Constant), Teacher Performance

b. Dependent Variable: Learning outcomes

Source: Primary data processed with SPSS 29, 2024

Table 6 shows the coefficient of determination (R Square) value of 0.276 or 27.6%. So it can be said that 27.6% of the Teacher Performance variable (X) can explain the Student Learning Outcome variable (Y), while the remaining 72.4% is explained by other variables not examined in this study. From the data analysis, this study aims to determine the effect of teacher performance on student learning outcomes in mathematics. The findings of this study indicate a significant effect of teacher performance on student learning outcomes in mathematics. These results are important to compare with previous research findings to understand how much teacher performance contributes to improving student learning outcomes.

Previous studies that support the findings of this study indicate that teacher performance has a positive effect on student learning outcomes. For example, [Ningsih \(2021\)](#) showed a moderate positive effect between teacher performance and student learning outcomes. This indicates that improving teacher performance can potentially improve student learning outcomes. [Amaliah \(2023\)](#) found that although there was an effect of teacher performance on mathematics learning outcomes, the measured correlation coefficient was in the range of 0.569, indicating a moderate effect. These results align with this study, which shows a positive relationship between teacher performance and student learning outcomes, but with a more moderate effect than other studies that show a greater effect. However, not all studies show that teacher performance significantly affects student learning outcomes. [Wahyudi \(2021\)](#) shows that teacher performance only affects 6.4% of student learning outcomes in religious subjects. This suggests that teacher performance may not be the only factor influencing learning outcomes, and other factors, such as curriculum, learning environment, and student motivation, may have a greater effect.

Based on the results of the study and comparison with previous studies, it can be concluded that teacher performance plays an important role in improving student learning outcomes in mathematics, but it cannot be ignored that many other factors affect these results. Therefore, strategies to improve the quality of education must include improving teacher performance and other aspects such as student motivation, parental support, and educational facilities and resources. There should be a continuous professional development program to improve all aspects of teacher performance. This program can include regular training, seminars, and opportunities to share best practices with fellow teachers. Regular evaluation of teacher performance and training programs is also important to ensure that teachers continue developing and improving their teaching quality.

The findings of this study align with, and offer valuable contrasts to, previous research on the relationship between teacher performance and student learning outcomes. For instance, [Pido et al. \(2023\)](#) reported that teacher performance explained 48.8% of the variance in student outcomes, notably higher than the 27.6% observed in this study, potentially due to differences in subject matter, educational level, or analytical methods. [Suwartini et al. \(2023\)](#) found that teacher performance affected only 20% of student outcomes, suggesting that factors such as student engagement and curriculum may be more prominent in their context. In comparison, [Hernawati et al. \(2020\)](#) demonstrated that teachers' professional competence accounted for 25% of the variance in student achievement, a figure slightly lower than this study but still emphasizing the substantial effect of

teacher performance. Additionally, [Soro et al. \(2022\)](#) and [Nurul \(2021\)](#) also highlighted the significant effect of teacher competence on student learning, although they did not provide specific R^2 values, reinforcing the conclusion that teacher effectiveness is a critical factor in promoting academic success. Together, these studies provide a nuanced understanding of how teacher performance affects student outcomes across various educational settings and contexts.

CONCLUSION

Based on the research findings, teacher performance significantly affects student learning outcomes in mathematics, aligning with previous studies that indicate a positive, moderately strong relationship. However, this study also reveals that teacher performance alone may not substantially improve student outcomes, as other factors play a crucial role. Therefore, while enhancing teacher performance is important, it must be complemented by addressing additional variables such as parental support, educational resources, and student motivation. To improve teacher performance, it is recommended that schools implement regular professional development programs, such as workshops focused on lesson planning, content mastery, and effective teaching strategies. Furthermore, a structured evaluation and feedback system should be in place to foster continuous improvement in teaching practices. In addition, non-performance factors, like parental involvement and adequate school facilities, should not be overlooked, as they also contribute to student success. Schools should also focus on supporting students with low learning outcomes by offering remedial programs and additional assistance to help these students meet the required standards. Overall, a balanced approach that considers various influencing factors and teacher performance improvement is necessary to achieve significant progress in student learning outcomes. Future research should further explore these factors to provide a more comprehensive understanding of the dynamics affecting student performance.

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