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The influence of self-efficacy on learning outcomes mathematics: Mediated motivation to learn mathematics

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Abstract.
This study seeks to elucidate the impact of self-efficacy on learning motivation and mathematics learning outcomes of seventh-grade students enrolled at a school in Mataram City. Furthermore, it explores the role of learning motivation as a mediating variable in this relationship. Employing a quantitative approach with a correlational design, the study sample comprises 168 individuals, selected through a simple random sampling technique. Data was collected via a questionnaire assessing self-efficacy, learning motivation, and mid-term test scores. The path analysis revealed that self-efficacy exhibited a positive and statistically significant influence on both learning motivation (86.8%) and learning outcomes (21.9%). Conversely, learning motivation did not demonstrate a significant impact on learning outcomes (7.6%) nor did it mediate the association between self-efficacy and learning outcomes. This study underscores the paramount significance of self-efficacy in fostering learning motivation. While increased motivation may not directly translate into enhanced learning outcomes, it necessitates the implementation of more effective learning strategies and teacher support to augment student achievement.

Keywords:
Mathematics learning outcomes; learning motivation; self-efficacy

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INTRODUCTION

Mathematics is one of the subjects that has an important role in shaping the ability to think logically, systematically, and critically. Through mastery of mathematics, students can develop the ability to solve problems, both academic and related to everyday life. Not only is it a tool in mastering science and technology, mathematics also trains accuracy and consistency in thinking (Dianty et al., 2025). Therefore, mastery of mathematics is one of the important indicators in assessing the success of education in general. However, the reality in the field shows that students' math learning outcomes are still relatively low. Many students have not reached the Minimum Completeness Criteria (KKM), and even have difficulty in understanding the basic concepts of mathematics that have been taught. This low learning outcome is a problem that needs to be addressed seriously because it has an impact on students' readiness to face the next level of education and in adapting to the times (Muharomi & Afriansyah, 2022).

Low mathematics learning outcomes are not solely caused by external factors such as teaching methods, teacher quality, or availability of learning facilities, but are also strongly influenced by internal factors within students, especially self-efficacy and learning motivation (Hamzah et al., 2023). Self-efficacy, which is an individual's belief in his or her ability to complete tasks or achieve certain goals, has been shown to contribute significantly to academic achievement

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(Pratiwi & Wuryandani, 2020). Students with high self-efficacy will feel more confident in facing challenges, show greater perseverance, and be able to overcome obstacles in the learning process, including in subjects that are considered difficult such as mathematics (Utami, 2020). In contrast, students with low self-efficacy tend to easily feel like failures, avoid challenges, and show higher levels of academic stress, which ultimately has negative implications for their learning outcomes (Amaliyah et al., 2023).

In addition to self-efficacy, learning motivation is also a crucial factor in influencing student engagement in the learning process. High learning motivation makes students more enthusiastic, active, and consistent in participating in learning, and this contributes to the achievement of more optimal learning outcomes (Nurhayati & Sugilar, 2023). In the context of mathematics learning, strong motivation can encourage students to not only understand concepts, but also dare to try to solve difficult problems independently (Nugroho, 2022). In contrast, students with low motivation tend to show passive behavior, lack initiative, and have a tendency to avoid challenging subjects. Therefore, to improve overall mathematics learning outcomes, it is necessary to have an approach that not only focuses on the teaching aspect, but also strengthens students' internal factors, especially self-efficacy and learning motivation.

Several previous studies have shown a significant relationship between self-efficacy, learning motivation, and students' mathematics learning outcomes. For example, research by Taufik dan Komar (2022), found that students who have a high level of self-efficacy also show strong learning motivation, which ultimately contributes to improving math learning outcomes. Another study by Aryanti and Muhsin (2020), also confirmed that self-efficacy and learning motivation jointly affect students' independence and outcomes. However, there are not many studies that comprehensively examine the relationship between these three variables simultaneously in the context of learning mathematics at the junior secondary level, especially in Islamic education environments such as madrasah.

Therefore, this study aims to address the existing gap by focusing on the influence of self-efficacy and learning motivation on students' mathematics learning outcomes. This research is essential as it provides a deeper and more detailed understanding of the internal factors that affect students' academic achievement, particularly the extent to which self-efficacy and motivation contribute to learning success. The findings are also expected to serve as a valuable reference for teachers in designing more effective instructional strategies that can enhance students' confidence and motivation in learning mathematics.

Based on field data obtained through interviews with two teachers at a state Islamic junior high school (madrasah tsanawiyah) in the city of Mataram on November 12, 2024, it is known that the results of the odd midterm assessment of mathematics subject VII grade students in the 2024/2025 academic year have not fully reached the Minimum Completeness Criteria (KKM) value. So that the results of the analysis of student math score data as many as 168 respondents, it was found that the average student score was 57.46 with a standard deviation of 14.176. When compared with the Minimum Completion Criteria (KKM) of 70, it is known that 136 students (around 80.95%) scored below the KKM. Meanwhile, only 32 students (around 19.05%) managed to reach or exceed the KKM score. This finding shows that most students have not reached the level of mastery of the material expected in mathematics learning. The high proportion of students scoring below the KKM indicates the need for evaluation and improvement in learning strategies, including strengthening internal factors such as self-efficacy and learning motivation, which have been shown to influence the achievement of learning outcomes.

Self-efficacy can be categorized into three levels, namely low, medium, and high. Students with low self-efficacy tend to feel incapable of completing tasks, avoid challenges, are passive, give up easily, and have little confidence that the efforts made can improve learning outcomes (Nugraha et al., 2016). Students with moderate self-efficacy show inconsistent beliefs, try to complete tasks with assistance, are more active in doing tasks that are considered easy, and their learning motivation is influenced by previous experiences. Meanwhile, students with high self-efficacy have

strong beliefs in their own abilities, are active, are able to survive failure, focus on achieving goals, and are able to learn independently (Syawahid & Putrawangsa, 2017).

METHOD

This study uses a quantitative approach with a correlational research type, which was chosen because it allows researchers to measure the relationship between self-efficacy, learning motivation, and mathematics learning outcomes objectively based on numerical data analyzed using statistical techniques. The sample in this study consisted of 168 seventh-grade students from a state Islamic junior high school in the city of Mataram, which were selected through simple random sampling technique based on the Slovin formula from a total population of 289 students (Majdina et al., 2024). Based on the research focus, which wants to see the extent to which self-efficacy and learning motivation contribute to predicting learning outcomes, this research is categorized as a predictive correlation. Predictive correlation is used to determine the relationship between variables while identifying independent variables that have predictive ability of the dependent variable, without explaining the cause-and-effect relationship directly (Sihotang, 2023).

Data collection techniques in this study were carried out through distributing questionnaires and documentation. The research instruments used were self-efficacy and learning motivation questionnaires, each consisting of 20 statements arranged based on the indicators of the variables studied. Self-efficacy indicators adopted from Bandura (2020) in this study were carried out by adjusting three main aspects to the context of mathematics learning at the junior high school level. The first aspect, magnitude (task difficulty), was modified into statements that measure students' perceptions of their ability to solve math problems with varying levels of difficulty. The second aspect, generality, was developed into statements that describe students' ability to use previous learning experiences to deal with new tasks or materials in mathematics lessons. The third aspect, strength, was developed into statements that measured the consistency of students' beliefs to keep trying to complete math tasks despite facing difficulties or failures

Meanwhile, learning motivation indicators adapted from Nurjanah and Aplilianti (2022) were modified to reflect the context of mathematics learning in the MTs environment. The indicators are translated into questionnaire items that measure: (1) internal drive in the form of students' desire and desire to understand mathematics; (2) hopes and ideals related to the role of mathematics in achieving future goals; (3) confidence in facing the challenges of learning mathematics; (4) independence and courage to express opinions in the learning process; (5) curiosity and pleasure in solving mathematical problems or problems; and (6) students' perceptions of self-competence, autonomy in learning, and the relationship between mathematics learning goals and personal values. This modification aims to make these indicators relevant to the characteristics and learning experiences of students at the MTs level.

Before being distributed, the questionnaire was validated by an expert lecturer with a doctoral degree in Mathematics Education, who has more than 10 years of experience in quantitative research and instrument development. The validator also teaches research methodology courses and is active in mentoring scientific papers. Validation was carried out to ensure that each statement item was relevant and in accordance with the indicators of the variables under study. Additionally, to ensure empirical validity, the instrument undergoes testing to assess its level of validity and reliability. The results pertaining to the reliability evaluation of the utilized instrument are presented in Table 1.

Table 1. Reliability test results

	Cronbach's Alpha	Cronbach's Alpha Value	Note
Self-Efficacy (X1)	0.821	0.7	Reliable
Learning Motivation (X2)	0.873	0.7	Reliable

The scale used in this study is a Likert scale, with four answer options (Refer to Table 2) consisting of positive and negative statements, namely SA (Strongly Agree), A (Agree), D

(Disagree), and SD (Strongly Disagree). Positive statements contain items that support the attitude object, while negative statements contain items that do not support the attitude object (Budiaji, 2013). The use of a 4-point Likert scale in this study was chosen with the consideration of obtaining more explicit and clear data regarding students' attitudes, perceptions, and beliefs about self-efficacy and learning motivation. The four-point scale (without a neutral option) encourages respondents to make a more definitive choice between positive and negative attitudes toward the statements provided, thereby minimizing ambiguity in data interpretation. For example, statements measuring self-efficacy include students' confidence in completing mathematics tasks and their ability to understand difficult material, while statements on learning motivation cover students' interest in learning mathematics and their efforts to overcome difficulties. By using relevant statements for each indicator, this scale is expected to provide a clearer understanding of the factors influencing students' learning outcomes in mathematics. In addition, this scale is considered more effective in revealing true attitudinal tendencies as respondents cannot choose neutral or undecided attitudes, which are often chosen out of indecisiveness or unwillingness to take sides.

Table 2. Likert scale scoring format

Student Response	Favorable	Unfavorable
Strongly Agree (SA)	4	1
Agree (A)	3	2
Disagree (D)	2	3
Strongly Disagree (SD)	1	4

Data analysis in this study includes several stages, namely descriptive analysis, prerequisite tests, and hypothesis testing using SPSS. Descriptive analysis is carried out to describe data using statistical calculations such as mean, median, mode, and standard deviation (Sugiyono, 2020). Prerequisite tests in this study include normality, multicollinearity, heteroscedasticity, and linearity tests to ensure the data meet the assumptions required in statistical analysis. The normality test was carried out using the Kolmogorov-Smirnov method in SPSS, which shows that the data is normally distributed if the significance value is greater than 0.05. The multicollinearity test uses the Variance Inflation Factor (VIF), where VIF < 10 indicates no multicollinearity. The heteroscedasticity test is conducted with the Glejser test, where a significance value > 0.05 indicates the absence of heteroscedasticity symptoms. Finally, a linearity test is conducted to ensure the relationship between the independent and dependent variables is linear, with a probability value > 0.05 indicating a linear relationship. All these tests are important to ensure the quality and validity of the data used in path analysis and multiple linear regression.

Furthermore, hypothesis testing was carried out through path analysis and multiple linear regression to determine the relationship and influence between the variables studied. This research is structured with the following hypothesis.

Hypothesis I

H_0: There is no direct influence between Self-efficacy on Learning Motivation.

H_1: There is a direct influence of Self-efficacy on Learning Motivation.

Hypothesis II

H_0: There is no direct influence between Self-efficacy on Learning Outcomes.

H_1: There is a direct influence between Self-efficacy on Learning Outcomes.

Hypothesis III

H_0: There is no direct influence between Learning Motivation and Learning Outcomes.

H_1: There is a direct influence between Learning Motivation and Learning Outcomes.

Hypothesis IV

H_0: There is no indirect influence of self-efficacy on mathematics learning outcomes through learning motivation as a mediator.

H_1: There is an indirect influence of self-efficacy on mathematics learning outcomes through learning motivation as a mediator.

RESULTS AND DISCUSSION

Descriptive analysis results regarding *self-efficacy* (X1) and learning motivation (X2) were collected directly through distributing questionnaires to respondents. Meanwhile, data on learning outcomes were obtained through documentation of grades given by subject teachers. Descriptive statistics are specific methods employed to calculate, describe, and summarize collected research data in a logical, meaningful, and efficient manner. These statistics are typically reported numerically in the manuscript text or its accompanying tables, or graphically in its figures (Vetter, 2017). The results of descriptive statistical analysis research can be seen in the following Table 3.

Table 3. Results of descriptive analysis test

	N	Minimum	Maximum	Mean	Std. Deviation
Self-Efficacy	168	33	74	57.57	6.773
Motivation to learn	168	42	74	57.43	6.469
Learning outcomes	168	24	90	57.46	14.176
Valid N (listwise)	168				

Based on Table 3, the analysis results show that the average score of students' mathematics is 57.46, with the lowest score of 24 and the highest of 90. These values are quite varied, as seen from the standard deviation of 14.176. Meanwhile, students' mean *Self-efficacy* was 57.57 with a standard deviation of 6.773, and the mean Learning Motivation was 57.43 with a standard deviation of 6.469. These two factors have smaller variations compared to math scores, which means that students' levels of *Self-efficacy* and motivation tend to be more evenly distributed, while the differences in math scores between students are larger. The implication is that even though students have almost equal self-efficacy in learning, their grade achievement varies significantly. This indicates that self-efficacy is not the only factor that influences learning outcomes; other factors such as motivation, learning strategies, environment or external support are likely to play a role in determining students' academic success. To clarify this condition, the average acquisition of each variable is illustrated in Figure 1.

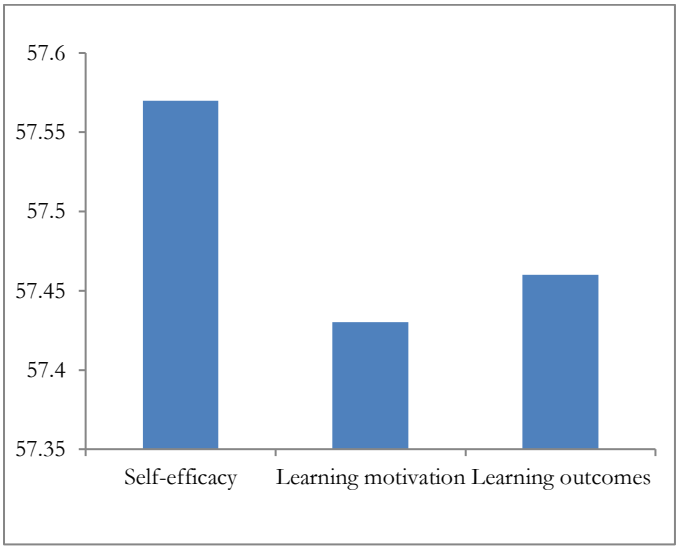

Figure 1. Comparison of average self-efficacy values, learning motivation and learning outcomes

As depicted in Figure 1, students' self-efficacy exhibits the highest average value, approximately 57.57. Learning outcomes follow with an average of around 57.46, while learning motivation exhibits the lowest average, approximately 57.43. Although the three average values are

remarkably close, the graph visually demonstrates that students' self-efficacy is slightly higher than the other two variables. This suggests that, in general, students possess a positive self-efficacy in the learning process, albeit this is not fully manifested in their motivation or learning outcomes.

Classical Assumption Test

Normality Test

In this study, the normality test is conducted to assess whether the data presented for the variables adhere to a normal distribution. The Kolmogorov-Smirnov test is employed as the statistical tool to facilitate this assessment within the SPSS program. Data is deemed normally distributed if the significance level associated with the test statistic exceeds 0.05 (Ahadi & Zain, 2023). The outcomes of the normality test are presented in Table 4.

Table 4. Normality test results

N	Kolmogorov-Smirnov Z	Sig.	Condition	Conclusion
168	0.061	0.200	0.200 > 0.05	Normal Distribution

Based on Table 4, the results of the normality test using the One-Sample Kolmogorov-Smirnov method shows that the Asymp. Sig. value of 0.200 is greater than 0.05 . This indicates that the residual data in this study is normally distributed, so that the assumption of normality in statistical analysis has been met.

Multicollinearity test

The multicollinearity test aims to determine the correlation between independent variables in the regression model. A good regression model is data that has no correlation between variables. The findings of the multicollinearity test conducted in this study are presented in Table 5.

Table 5. Multicollinearity test results

Data Grouping	Tolerance	VIF	Condition	Conclusion
Self-efficacy	0.246	4,067	0.246 > 0.01 or 4.067 < 10	No symptoms of multicollinearity were detected.
Motivation to learn	0.246	4,067	0.246 > 0.01 or 4.067 < 10	No symptoms of multicollinearity were detected.

The results of the multicollinearity test indicate that the variables of self-efficacy and learning motivation do not have a very strong relationship or influence each other excessively. This is evidenced by the tolerance value of 0.246 which is greater than 0.01, and the VIF value of 4.067 which is still below the limit of 10. Based on these results, it can be concluded that these two independent variables do not experience symptoms of multicollinearity, so they are suitable for further regression analysis.

Heteroscedasticity Test

The heteroscedasticity test is employed to ascertain the presence of heteroscedasticity, which refers to the non-constant variance of residuals in a regression model. The test outcomes are presented in Table 6.

Table 6. Heteroscedasticity test results

Data Grouping	t	Sig	Condition	Conclusion
Self-efficacy	1,348	0.180	0.180 > 0.05	No symptoms of Heteroscedasticity were detected
Learning motivation	-0.766	0.445	0.445 > 0.05	No symptoms of Heteroscedasticity were detected

The results of the heteroscedasticity test show that the variables of self-efficacy and learning motivation do not experience symptoms of heteroscedasticity or uneven data distribution. This can be seen from the significance value of self-efficacy of 0.180 and learning motivation of 0.445, where both values are greater than 0.05. This means that the distribution of data on both variables is even and there is no significant difference, so the regression model used is considered good and feasible for further analysis.

Linearity Test

This linearity test is designed to assess whether the relationship between the independent variables (self-efficacy and learning motivation) and the dependent variable (learning outcomes) is linear. The results of the linearity test between self-efficacy (X1) and learning outcomes (Y), as well as between learning motivation (X2) and learning outcomes (Y), will be presented in Table 7 and Table 8.

Table 7. Anova test results of the effect of X1 on Y

			Sum of Squares	df	Mean Square	F	Sig.
Learning outcome* Self Efficacy	Between Groups	(Combined)	8557.849	32	267.433	1.444	.077
		Linearity	1606.527	1	1606.527	8.675	.004
		Deviation from Linearity	6951.322	31	224.236	1.211	.227
	Within Groups		25001.859	135	185.199		
	Total		33559.708	167			

Based on the ANOVA analysis results obtained, the relationship between self-efficacy and learning outcomes showed a significant effect on the linearity test. The significance value for the linearity test is 0.004, which is smaller than 0.05, indicating that there is a significant linear relationship between self-efficacy and learning outcomes. However, in the deviation from linearity test, the significance value of 0.227 indicates that the deviation from the linear relationship is not significant. Overall, although there is a significant effect in the linear relationship between self-efficacy and learning outcomes, the effect is not very strong, because the overall test between groups (combined) obtained a significance value of 0.077 which is greater than 0.05, which indicates that overall, self-efficacy does not have a significant effect on learning outcomes when compared to other factors that have not been identified.

Tabel 8. Anova test results of the effect of (X2) on (Y)

			Sum of Squares	df	Mean Square	F	Sig.
Learning outcome* learning motivation	Between Groups	(Combined)	6023.567	30	200.786	.999	.477
		Linearity	195.704	1	195.704	.974	.326
		Deviation from Linearity	5827.863	29	200.961	1.000	.475
	Within Groups		27536.142	137	200.994		
	Total		33559.708	167			

Based on the ANOVA analysis results obtained, it can be concluded that learning motivation does not have a significant influence on learning outcomes in the sample tested. This is indicated by significance values (Sig.) greater than 0.05 in all tests, including the tests of linear relationship (Sig. = 0.326) and deviation from linearity (Sig. = 0.475). Although there was variation between the groups, there was no evidence strong enough to suggest a significant difference in learning outcomes influenced by learning motivation. Therefore, although learning motivation is often considered an important factor in education, the results of this analysis show that in the context

of this study, it was not able to significantly explain variations in student learning outcomes.

Path Analysis Test

The following are the results of path analysis that test the relationship between variables in this study. The first test shows the direct influence of self-efficacy (X1) on learning motivation (X2). The magnitude of self-efficacy 's contribution to learning motivation can be seen in the Table 9. Based on the results of the partial hypothesis test in the table above, the t value is 22.565 with a significance level of 0.000. The significance value is smaller than the significance level of 0.05 (0.000 <0.05), so it can be concluded that self-efficacy has a significant effect on learning motivation. In addition, the beta value of 0.868 indicates that self-efficacy makes a positive and strong contribution to increasing learning motivation. This means that the higher the level of self-efficacy in students, the higher the learning motivation they have.

Table 9. Partial t-test of model 1

Data Grouping	t	Sig.	Beta	Condition	Conclusion
Self-efficacy to Learning Motivation	22,565	0,000	0.868	0.000 < 0.05	There is a significant influence

The coefficient of determination (R Square) quantifies the extent to which the independent variable (self-efficacy) influences the mediating variable (learning motivation). The statistical calculations for the coefficient of determination are presented in Table 10.

Table 10. Coefficient of determination of model 1

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868 [a]	0.754	0.753	3,217

a. Predictors: (Constant), Self-Efficacy

Based on the Model Summary table, the R Square value of 0.754 means that Self-Efficacy (X1) has an influence of 75.4% on Learning Motivation (X2). This shows that the greater a person's self-efficacy towards their abilities, the higher their learning motivation. The Standard Error of the Estimate value of 3.217 shows that there is an average difference between the predicted results and the actual data. While the calculation result of e1 of 0.495 shows that there are still 49.5% other factors outside of Self-efficacy that influence Learning Motivation.

The subsequent analysis examines the direct impact of self-efficacy (X1) on learning outcomes (Y). This investigation seeks to ascertain the direct contribution of self-efficacy to learning outcomes, excluding the influence of other variables. The findings pertaining to this influence are presented in Table 11.

Table 11. Partial t-test of model 2

Data Grouping	t	Sig.	Beta	Condition	Conclusion
Self-efficacy to learning outcomes	2,889	0.004	0.219	0.004 < 0.05	There is a significant influence

The test results above show that the t value is 2.889 with a significance level of 0.004. The significance value is smaller than the significance level of 0.05 (0.004 <0.05), so that self-efficacy has a significant influence on learning outcomes. The beta value of 0.219 shows that self-efficacy makes a positive contribution with a low category to learning outcomes. This means that the higher the self-efficacy of students, the higher the learning outcomes achieved, although the influence given is not too great.

The coefficient of determination (R^2) serves as a metric to quantify the extent to which the independent variable (self-efficacy) exerts influence on the dependent variable (learning

outcomes). The coefficient of determination value, derived from statistical calculations, is presented in Table 12.

Table 12. Coefficient of determination of model 2

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.219 [a]	.048	.042	13,874

a. Predictors: (Constant), Self Efficacy

Based on the Table 12, the test results show that the relationship between Self-efficacy and Learning Outcomes is relatively weak with an R value of 0.219. Only 4.8% of changes in Learning Outcomes can be explained by Self-efficacy , while the rest is influenced by other factors. After taking into account the number of variables, the contribution of Self-efficacy decreased slightly with an Adjusted R Square value of 0.042. The magnitude of the prediction error in the model is 13,874, indicating that there are still many other factors that influence Learning Outcomes. Although there is an influence, the relationship between these two variables is not very strong.

Furthermore, testing was conducted to ascertain the direct impact of learning motivation (X2) on learning outcomes (Y). Learning motivation significantly influences students' ability to attain optimal learning outcomes. The magnitude of learning motivation's contribution to learning outcomes is evident in Table 13.

Table 13. Partial t-test of model 3

Data Grouping	t	Sig.	Beta	Condition	Conclusion
Learning Motivation to Learning Outcomes	0.987	0.325	0.076	0.325 > 0.05	There is no significant effect

Based on the Table 13, the partial hypothesis test shows that the t value is 0.987 with a significance level of 0.325. The significance value is greater than the significance level of 0.05 (0.325 > 0.05), so that learning motivation does not have a significant effect on learning outcomes. The beta value of 0.076 indicates that the contribution of learning motivation to learning outcomes is very low. This indicates that the level of student learning motivation does not have a significant impact on the learning outcomes achieved.

Following the evaluation of the direct impact of Learning Motivation (X2) on Learning Outcomes (Y), a determination coefficient analysis was undertaken to ascertain the extent of the variable's contribution to learning outcomes. The results of this analysis, as presented in Table 14, elucidate the extent to which Learning Motivation (X2) can account for variations in changes in Learning Outcomes (Y).

Table 14. Coefficient of determination of model 3

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.076 [a]	.006	.000	14.177

a. Predictors: (Constant), Learning Motivation

Based on the Table 14, the R Square value of 0.006 indicates that Learning Motivation only contributes 0.6% in influencing Learning Outcomes. This indicates that Learning Motivation does not have a significant influence, so that most of the variations in Learning Outcomes are influenced by other factors. Additionally, this study examined the indirect effect of self-efficacy (X1) on learning outcomes (Y) through the mediation of Learning Motivation (X2). The primary objective of this analysis is to determine the role of Learning Motivation in mediating the relationship between self-efficacy and learning outcomes. The results pertaining to the indirect effect are presented in Table 15.

Based on the results of regression analysis, it is known that the Self-Efficacy variable (X_1)

has a t-count value of 4.165 with a significance of 0.000. This significance value is smaller than 0.05 (p-value <0.05), so it can be concluded that Self-Efficacy has a significant effect on Learning Outcomes. The beta coefficient of 0.620 indicates that the direction of the influence is positive, meaning that the higher the level of self-efficacy possessed by students, the higher the learning outcomes achieved. This indicates that students' belief in their own abilities plays an important role in their academic success.

Table 15. Partial t-test of model 4

Data Grouping	t	Sig.	Beta	Condition	Conclusion
Self-efficacy to Learning Outcomes	4,165	0,000	0.620	0.000 < 0.05	There is a significant influence
Learning Motivation to Learning Outcomes	-3,104	0.002	-0.462	0.002 < 0.05	There is a significant influence

Meanwhile, the Learning Motivation variable (X_2) shows a t-count value of -3.104 with a significance of 0.002, which is also smaller than 0.05. This shows that Learning Motivation also has a significant effect on Learning Outcomes. However, the beta coefficient of -0.462 indicates that the direction of the effect is negative. This finding is quite interesting and deserves further attention, because theoretically, learning motivation is generally assumed to have a positive influence on learning outcomes.

The negative effect of learning motivation on learning outcomes can be interpreted that there is a possibility of distortion in the form or quality of motivation that students have. For example, extrinsic motivation (based on rewards, punishment, or external pressure) that is too dominant can reduce the effectiveness of learning, compared to intrinsic motivation that arises from within. It can also happen that highly motivated students experience excessive pressure or anxiety, which in turn has a negative impact on their academic performance. Therefore, it is important for educators to not only increase student motivation, but also pay attention to the types and sources of motivation that develop in learners.

The regression coefficient test results and significance value are less than 0.05, indicating that the alternative hypothesis is accepted. This suggests a significant indirect effect between Self-Efficacy (X1) and Learning Outcomes (Y) mediated by Learning Motivation (X2). Table 16 presents the results of the path analysis, demonstrating the magnitude of the indirect effect.

Table 16. Coefficient of determination of model 4

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.317[a]	0.100	0.089	13,527

a. Predictors: (Constant), Learning Motivation, Self-Efficacy

Based on the Table 16, the results of the Model Summary table are known, it is known that the R Square value is 0.100, which means that the contribution of the influence of the Self- Efficacy (X1) and Learning Motivation (X2) variables on Learning Outcomes (Y) is 10%. This shows that Self-Efficacy and Learning Motivation only have a relatively small influence on Learning Outcomes.

Meanwhile, the Standard Error of the Estimate (SE) value of 13.527 illustrates the distribution of prediction errors in the model. To calculate the value of e1, the formula $\sqrt{(1 - R^2)}$ is used, which is $\sqrt{(1 - 0.100)} = 0.949$. This value indicates the level of error in the prediction of the regression model.

To calculate indirect effects in path analysis, commonly used methods are the Sobel test or bootstrap technique. The Sobel test specifically tests the significance of indirect effects by multiplying the path value between the two variables that form the mediation path, as done in this

analysis, namely multiplying the path value of Self-Efficacy ⟶ Learning Motivation (0.868) with Learning Motivation ⟶ Learning Outcomes (-0.462). The result of this multiplication produces an indirect effect value of -0.401. However, to ensure that the effect is significant, the bootstrap technique is often used to estimate the confidence interval of this indirect effect value through a resampling process. With bootstrapping, we can obtain a more accurate distribution of indirect effect values without having to rely on the normality assumption. Therefore, although the indirect effects in this analysis are calculated by multiplying the path values, it is important to conduct further tests to ensure that the results are not just coincidental and that the effects are statistically significant.

Based on the results of the path analysis conducted (Refer to Figure 2), several findings related to the influence between variables can be concluded as follows: (1) Self-efficacy (X1) has a positive and significant direct influence on learning motivation (X2) with a path value of 0.868. This shows that the higher the self-efficacy , the higher the student's learning motivation; (2) Self-efficacy (X1) has a positive and significant influence on learning outcomes (Y) with a path value of 0.620. This means that increasing self-efficacy will have an impact on increasing student learning outcomes; (3) Learning motivation (X2) does not have a significant influence on learning outcomes (Y) with a path value of -0.462, which indicates that increasing learning motivation does not contribute positively to learning outcomes; and (4) The indirect effect of self-efficacy (X1) on learning outcomes (Y) through learning motivation (X2) is calculated by multiplying the path value X1 ⟶ X2 (0.868) by X2 ⟶ Y (-0.462) to obtain -0.401.

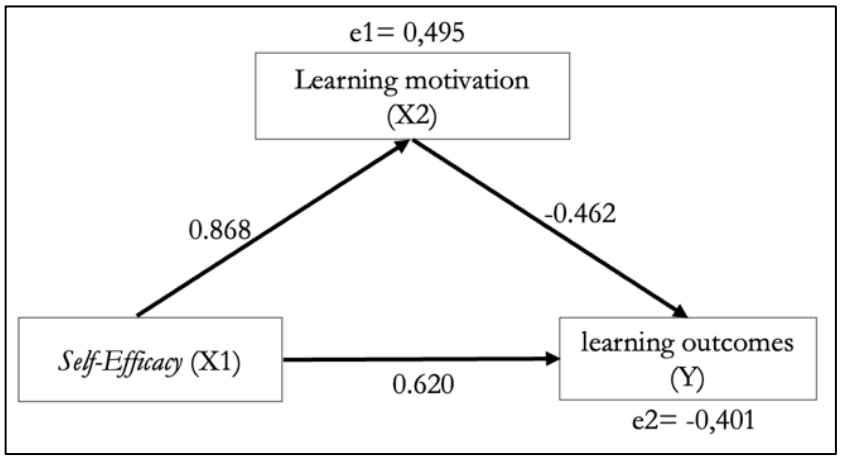

Figure 2. Path analysis results

This value shows that the indirect effect of self-efficacy through learning motivation is negative, although the direct effect of self-efficacy on learning outcomes is positive. This result shows that learning motivation does not mediate the relationship between self-efficacy and learning outcomes effectively, so it is necessary to consider other factors that may affect student learning outcomes.

Multiple Regression Analysis Test

A multiple linear regression test is conducted to assess the form and degree of causal relationship between independent variables and dependent variables. The objective of this test is to ascertain the extent to which each independent variable simultaneously influences the dependent variable. The outcomes of the multiple linear regression test are presented in Table 17.

Based on the results of regression analysis, the Self-Efficacy variable shows a *t-count* value of 4.165 with a significance of 0.000, which is smaller than 0.05. This shows that self-efficacy has a significant effect on learning outcomes. The constant coefficient of 40.199 indicates that in conditions of minimal or no self-efficacy influence, students' learning outcomes are estimated to be 40.199. Furthermore, the significance value smaller than 0.05 confirms that the relationship between self-efficacy and learning outcomes is significant, with an increase in self-efficacy

contributing to an increase in student learning outcomes.

Table 17. Results of multiple linear regression tests

Data Grouping	t	Sig.	Constant	Condition	Conclusion
Self-efficacy to Learning Outcomes	4,165	0,000	40,199	0.000 < 0.05	There is a significant influence
Learning Motivation to Learning Outcomes	-3,104	0.002	40,199	0.002 < 0.05	There is a significant influence

Meanwhile, Learning Motivation also shows a *t-count* value of -3.104 with a significance of 0.002, which is also smaller than 0.05. This indicates that Learning Motivation has a significant effect on learning outcomes. The constant coefficient for learning motivation of 40.199 illustrates that when learning motivation is absent or minimal, learning outcomes are estimated to be at 40.199. The significance value that is smaller than 0.05 corroborates that learning motivation contributes significantly to changes in learning outcomes. In conclusion, both variables, namely self-efficacy and learning motivation, have a significant influence on student learning outcomes, where both contribute to the changes that occur in the learning outcomes achieved by students

The Influence of Self-Efficacy (X1) on Learning Motivation (X2)

Based on the results of the partial hypothesis test, self-efficacy (X1) has a positive and significant effect on learning motivation (X2), with a t value of 22.565 and a significance level of 0.000. The beta value of 0.868 indicates that self-efficacy makes a strong contribution to increasing learning motivation. This shows that the higher the student's self-efficacy towards their abilities, the greater the student's motivation to study harder (Umaroh et al., 2020).

The results of this study are in line with research conducted by Taufik and Komar (2022), which shows that self-efficacy has a positive and significant relationship with students' learning motivation. Students with high self-efficacy tend to have strong self-confidence in completing academic tasks, thus encouraging focus and enthusiasm for learning. In addition, research conducted by Suryaningsih and Rahim (2019) also stated that self-efficacy training can increase students' learning motivation, thus strengthening the fact that self-efficacy has an important role in supporting students' learning motivation.

The Influence of Self-efficacy (X1) on Learning Outcomes (Y)

Based on the results of path analysis, Learning Motivation (X_2) does not show a significant effect on Learning Outcomes (Y) with a *t* value of 0.987 and a significance of 0.325, which is greater than 0.05. The beta value of 0.076 indicates that the contribution of learning motivation to learning outcomes is very low, which means that even though students have a high level of learning motivation, it does not always have a direct effect on improving their learning outcomes. This finding is in line with research conducted by Suryaningsih and Rahim (2019) which states that although learning motivation can encourage students to be more active, its effect on learning outcomes is not always consistent, especially if it is not accompanied by an effective learning approach.

However, this result contradicts the findings of Novianti and Sadipun (2020) research which shows that learning motivation has a significant influence on student learning outcomes. This difference in findings may be influenced by several factors that were not detected in this study, such as the learning methods used or environmental support that is more dominant in influencing learning outcomes. Research by Monika and Adman (2017) also found that although learning motivation has an influence on learning outcomes, the influence can vary depending on learning conditions and individual student characteristics.

In addition, it is important to pay attention to more in-depth effect sizes in this path analysis. The value of $R = -0.048$ for the relationship between Self-Efficacy (X_1) and Learning Outcomes

(Y) indicates a very small negative effect. Although the direct effect of Self-Efficacy on Learning Outcomes is still significant, this low effect size suggests that other more powerful and relevant factors may be more instrumental in mediating or amplifying student learning outcomes. Therefore, although learning motivation and self-efficacy contribute to learning outcomes, their influence cannot be viewed as the sole determining factor, and other factors such as learning quality and social interaction deserve more attention in future research.

The Influence of Learning Motivation (X2) on Learning Outcomes (Y)

Based on the results of the path analysis, Learning Motivation (X2) does not have a significant effect on Learning Outcomes (Y) with a t value of 0.987 and a significance of 0.325. The beta value of 0.076 indicates that the contribution of learning motivation to learning outcomes is very low. These results indicate that even though students have high learning motivation, this does not always have a direct impact on achieving better learning outcomes (Suryaningsih & Rahim, 2019).

This result is different from the research conducted by Novianti and Sadipun (2020) which showed that learning motivation has a significant influence on student learning outcomes. However, this difference can be caused by other factors such as more dominant learning methods and environmental support. Research by Monika and Adman (2017) also showed that although learning motivation influences learning outcomes, the influence varies depending on learning conditions and student characteristics.

The Influence of Self-efficacy (X1) through Learning Motivation (X2) on Learning Outcomes (Y)

Based on the results of the path analysis, it shows that the indirect effect of self-efficacy (X1) on learning outcomes (Y) through learning motivation (X2) is negative with a value of -0.401. This means that although self-efficacy has a direct positive effect on learning outcomes, the indirect effect through learning motivation actually reduces learning outcomes (Rachmawati & Nurlaili, 2024).

These results indicate that Learning Motivation (X2) does not act as an effective mediating variable in the relationship between self-efficacy (X1) and learning outcomes (Y). Research conducted by Rangkuti (2021) shows that self-efficacy and learning motivation simultaneously have a significant effect on learning outcomes, but this influence depends on the type of motivation and environmental factors that support the learning process. Thus, the interaction between self-efficacy , learning motivation, and learning outcomes shows that learning motivation is not the only mediating factor, but needs to be considered together with other factors in achieving more optimal learning outcomes.

CONCLUSIONS

The contribution of self-efficacy to learning outcomes in this study is shown through a significant linear relationship, with a significance value of 0.004 in the ANOVA linearity test. This shows that the higher the students' belief in their own ability to do math tasks, the better the learning outcomes achieved. However, the R^2 value of 4.8% indicates that the effect of self-efficacy on learning outcomes only explains a small part of the variance. This means that although it plays a role, self-efficacy is not the only factor determining learning outcomes.

In contrast, the findings on learning motivation showed an insignificant negative effect on learning outcomes, which could be due to two main possibilities. First, overmotivation, which is consistent with the explanation of the Yerkes-Dodson Law, states that optimal performance is achieved at moderate levels of motivation, while too much motivation can lead to stress, anxiety and decreased performance. Secondly, there can be bias in the measurement of motivation, for example if the instrument used is not able to properly distinguish between intrinsic motivation (internal motivation) and extrinsic motivation (external motivation, such as rewards or punishments), resulting in data that does not accurately reflect the psychological state of students.

To respond practically to these findings, schools can develop concrete intervention programs, particularly in the context of mathematics learning. One example is a scaffolding program, where teachers provide gradual assistance in solving mathematics problems, such as breaking down difficult problems into small steps and providing hints as necessary. This approach can build students' confidence gradually and effectively. In addition, collaboration between teachers and parents is also important, for example through regular communication about students' learning progress or involving parents in assisting with homework, to strengthen emotional and academic support from students' two main environments.

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