

The Influence of Self-Efficacy and Learning Interest on the Mathematical Problem-Solving Ability of MAN 1 Bone Students

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ABSTRACT

This study investigates the effect of self-efficacy and learning interest on the mathematical problem-solving skills of tenth-grade students at MAN 1 Bone. Employing an ex post facto design, the research involved 80 students selected from a population of 356 through systematic random sampling. Data were collected using self-efficacy and learning interest questionnaires, along with a problem-solving test on three-variable linear equations. The data were analyzed through descriptive and inferential statistics using multiple linear regression analysis. The descriptive findings indicate that most students demonstrated moderate levels of self-efficacy, learning interest, and problem-solving ability. Inferential analysis revealed that both self-efficacy and learning interest significantly and positively affected problem-solving skills, individually and jointly. Self-efficacy accounted for 29.6% of the variance, learning interest contributed 22%, and their combined effect reached 51.6%. These results highlight the essential role of psychological and motivational factors in mathematical learning. Strengthening students' confidence and interest can enhance their problem-solving competence, suggesting that instructional strategies should prioritize fostering both attributes to improve learning outcomes. This research contributes to the development of scientific insight, particularly in the field of education, related to self-efficacy, learning interest, and students' ability to solve mathematical problems. Furthermore, it can serve as a reference for implementing more effective learning models to increase students' learning interest.

KEYWORDS

Self Efficacy, Learning Interest, Mathematical Problem Solving Ability

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A. Introduction

The education sector is a key pillar in planning human resources capable of meeting the challenges of the times, where this process of equipping individuals begins from basic, secondary, and higher education ([Fatmawati et al., 2019](#)). Education significantly influences a nation's progress. Each person's potential can be developed through education, which will facilitate finding solutions to the problems they face ([Naufal & Alshaye, 2023](#)).

At every level of education, mathematics must be studied. In line with the Regulation of the Ministry of National Education, the process of mathematical problem-solving encompasses several stages, including identifying the problem, formulating a model, deriving a solution, and interpreting the outcome. These aspects are regarded as the central objective of mathematics instruction ([Amalia & Sari, 2024](#)). Similarly, the National Council of Supervisors of Mathematics (NCSM) emphasizes that the core aim of mathematics education lies in developing students' capacity to solve problems ([Mulyati, 2016](#)).

Problem-solving skills can help students make decisions and create resolution plans ([Septiani, 2022](#)). This is crucial for students to master as a means of practice to familiarize themselves with facing various problems, whether related to mathematics, other subjects, or situations in daily life ([Kurniawati et al., 2019](#)).

Despite the pivotal role of problem-solving in mathematics, empirical evidence reveals that many students continue to exhibit limited proficiency in this area ([Noor & Waluya, 2024](#)). Results from the PISA assessment further underscore this issue, showing that only 18% of Indonesian students reached at least level 2 competence, a figure far below the OECD average of 69%. In addition, almost none of the participants attained the highest proficiency levels, namely 5 or 6. In other words, with these test results, students are unable to model complex situations, determine, compare, and evaluate appropriate problem-solving plans ([OECD, 2023](#)). These findings suggest that a substantial proportion of Indonesian learners still struggle to apply mathematical knowledge to real-life contexts, which represents the fundamental essence of problem-solving ability.

Students in class X at MAN 1 Bone also face challenges in solving problems, including problem-solving questions. Some students can even model problems, but still make mistakes when solving math problems. This indicates that students are still not proficient enough at problem-solving. Students at MAN 1 Bone have characteristics that align with the focus of my research, namely self-efficacy, learning interest, and mathematical problem-solving abilities. This school has a fairly active mathematics learning program and a sufficient number of students to serve as a research sample. Furthermore, the diverse backgrounds of the students allowed me to obtain more representative data to examine variations in self-efficacy and learning interest. The school is also open and supportive of research activities.

There are several factors that cause students' low mathematical problem-solving abilities, namely internal factors and external factors. Internal aspects must be taken into account when examining students' problem-solving performance. One key determinant is self-efficacy, which reflects learners' confidence in their own abilities ([Zulkarnain dkk., 2023](#)). Bandura's ([Hendriana & Kadarisma, 2019](#)) defines self-efficacy as an individual's belief in their capacity to plan and carry out a series of actions to achieve specific goals. According to [Rahmi et al. \(2017\)](#), argue that this construct influences how individuals confront challenges and significantly shapes behavioral responses. In contrast, students with limited self-efficacy tend to withdraw or give up easily when facing difficulties. Furthermore, according to [Yuliyani et al. \(2017\)](#) students with high self-efficacy will succeed in their studies and be able to complete their academic tasks smoothly. For this reason, strengthening self-efficacy is essential to enable learners to effectively address and resolve problems.

Apart from self-efficacy, there are also other factors that can influence the ability to solve mathematical problems, namely interest in learning. The ability to solve mathematical problems is also influenced by learning interest ([Anggraini et al., 2022](#)). Interest is a person's attraction to something that drives them to do so. Learning interest can be understood as an individual's intrinsic motivation to actively engage in an activity, directing full attention and effort toward acquiring knowledge without external pressure ([Awaliyah & Fitrianna, 2018](#)). In the context of mathematics, students' enthusiasm for learning constitutes a crucial element that influences both their comprehension of concepts and their capacity to address mathematical problems ([Holidun et al., 2018](#)). Interest in learning can motivate students to seek strategies by utilizing their abilities based on their existing knowledge to find a solution ([Partayasa et al., 2020](#)). Based on the description, one of

the factors that causes low students' mathematical problem-solving abilities is self-efficacy and learning interest. Therefore, this study aims to analyze how self-efficacy and learning interest contribute to students' abilities in solving mathematical problems. This study is highly recommended because it can provide new knowledge to develop learning strategies/methods that focus on increasing students' self-efficacy and learning interest in facing mathematical challenges. Based on the description, the researcher feels the need to conduct research on the influence of self-efficacy and learning interest on students' mathematical problem-solving abilities at MAN 1 Bone.

B. Methodology

The research employed a quantitative research using an ex post facto approach because the variables being studied have already occurred, and the researcher does not manipulate these variables. This research was conducted in March 2025, with the population being all students in class X at MAN 1 Bone, located in Tanete Riattang, Bone, South Sulawesi. A total of 80 participants were chosen as the sample through the application of a systematic random sampling technique.

The study employed three instruments to collect the required data. First, the self-efficacy questionnaire, which was adapted from a scale developed by [Harpizon et al. \(2025\)](#) based on self-efficacy indicators according to [Bandura \(1997\)](#), namely magnitude, strength, and generality. Second, the learning interest questionnaire, which was developed by the researcher based on learning interest indicators according to [\(Safari, 2003\)](#), namely enjoyment, student interest, student attention, and student involvement. Third, the mathematical problem-solving ability test, was developed based on [Polya \(1973\)](#) four steps.

To ensure quality, the instruments were reviewed by two mathematics education experts who validated the relevance, clarity, and alignment of the items.

After the data is collected, the next step is to analyze the research data using descriptive analysis and inferential analysis, namely multiple linear regression analysis using the SPSS application.

For the variables of self-efficacy and learning interest, categorization according to [Azwar \(2012\)](#) was used, involving the calculation of the ideal mean (M), which is $\frac{1}{2} \times (\text{highest value} + \text{lowest value})$ and the ideal standard deviation (SD), which is $\frac{1}{6} \times (\text{highest value} + \text{lowest value})$. The scoring categories for self-efficacy and learning interest are presented in Table 1 and Table 2.

Table 1. *Self Efficacy Scoring Category*

Interval	Value	Value	Category
$Score \geq M + SD$	$Score \geq 75$	75 – 100	High
$M - SD \leq Score < M + SD$	$50 \leq Score < 75$	50 – 74	Medium
$Score < M - SD$	$Score < 50$	25 – 49	Low

Table 2. *Learning Interest Scoring Category*

Interval	Value	Value	Category
$Score \geq M + SD$	$Score \geq 60$	60 – 80	High
$M - SD \leq Score < M + SD$	$40 \leq Score < 60$	40 – 59	Medium
$Score < M - SD$	$Score < 40$	20 – 39	Low

The scoring categories for mathematical problem-solving ability were adopted from the categorization by [Rustella & Chotimah \(2023\)](#) in Table 3.

Table 3. Scoring Categories for Mathematical Problem-Solving Ability

Value Interval	Value Interval	Category
Value ≥ 79	79 – 100	High
$37 \leq \text{Value} < 79$	37 – 78	Medium
Value < 37	0 – 36	Low

C. Results and Discussion

1. Description of Self Efficacy of MAN 1 Bone Students

The outcomes of the descriptive statistical analysis for the self-efficacy variable among tenth-grade students at MAN 1 Bone are presented in Table 4.

Table 4. Results of Descriptive Statistical Analysis of Self-Efficacy

Statistics	Statistical Value
Sample Size	80
Ideal Maximum Score	100
Ideal Minimum Score	25
Maximum Score	91
Minimum Score	45
Mean	62,48
Standard Deviation	11,05
Variance	122,1

The average self-efficacy score obtained from 80 students was higher than half of the ideal maximum score. The standard deviation was 11.05, indicating that most students' self-efficacy scores fell within a range of points above or below the average value, calculated using the formula average $\pm$ standard deviation, which is $62,48 - 11,05 = 51,43$ to $62,48 + 11,05 = 73,53$. Therefore, the majority of students' scores ranged from 51.43 to 73.53. Furthermore, Learners' achievement was classified into three categories, namely low, moderate, and high, based on criteria developed by [Azwar \(2012\)](#), as shown in Table 5.

Table 5. Self-Efficacy Frequency Distribution

Value Interval	Category	Frekuensi	Persentase (%)
Score ≥ 75	High	12	15%
$50 \leq \text{Score} < 75$	Medium	61	76%
Score < 50	Low	7	9%

If displayed in the form of a bar chart, the frequency distribution of students' self-efficacy will look like Figure 1.

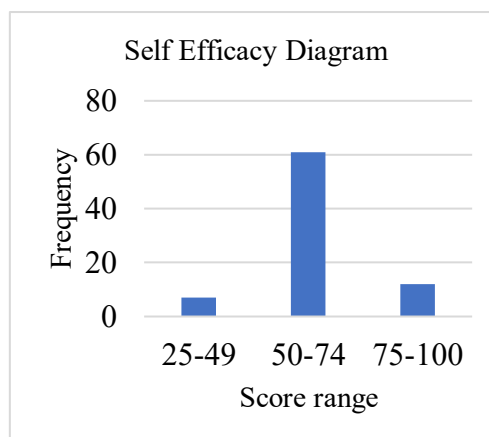


Figure 1. Self-Efficacy Frequency Distribution Diagram

Based on the calculation results per indicator, class X students of MAN 1 Bone are superior in the generality indicator by 68%, the strength indicator by 64%, and the magnitude indicator by 57%.

2. Description of Students Interest Mathematics at MAN 1 Bone

Table 6 displays the outcomes of the descriptive statistical analysis for the learning interest variable of tenth-grade students at MAN 1 Bone.

Table 6. Result of Descriptive Statistical Analysis of Learning Interest

Statistics	Statistical Value
Sample Size	80
Ideal Maximum Score	80
Ideal Minimum Score	20
Maximum Score	73
Minimum Score	36
Mean	51,98
Standard Deviation	9,29
Variance	86,38

The average score of interest in learning mathematics from 80 students is higher than half of the ideal maximum score. A standard deviation of 9.29 indicates that most student learning interest scores fall within a range of points above or below the average value, calculated using the formula $\text{average} \pm \text{standard deviation}$, which is $51,98 - 9,29 = 42,69$ to $51,98 + 9,29 = 61,27$. Therefore, the majority of student scores range from 42.69 to 61.27. It is shown in Table 7.

Table 7. Frequency Distribution of Learning Interest

Value Interval	Category	Frequency	Percentage (%)
Score ≥ 60	High	23	29%
$40 \leq \text{Score} < 60$	Medium	55	69%
Score < 40	Low	2	3%

If displayed in the form of a bar graph, the frequency distribution of students' interest in learning will look like Figure 2.

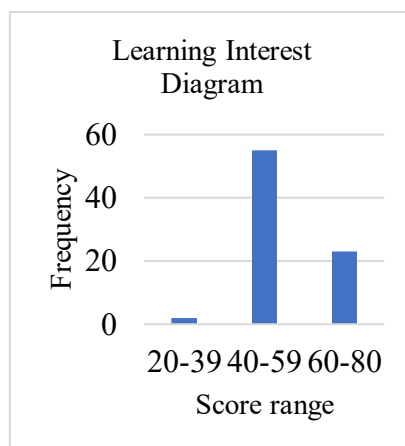


Figure 2. Frequency Distribution Diagram of Learning Interest

Based on the calculation results per indicator, class X students of MAN 1 Bone are superior in the indicator of attention to learning with a percentage of 69%, followed by involvement in learning at 66%, interest in learning at 63%, and enjoyment during the learning process at 62%.

3. Description of the Mathematical Problem-Solving Ability of MAN 1 Bone Students

Table 8 illustrates the descriptive statistical analysis results for the mathematical problem-solving ability variable of tenth-grade students at MAN 1 Bone.

Table 8. Result of Descriptive Statistical Analysis of Mathematical Problem-Solving Ability

Statistik	Statistical Value
Sample Size	80
Ideal Maximum Score	100
Ideal Minimum Score	0
Maximum Score	94
Minimum Score	17
Mean	54,5
Standard Deviation	21,49
Variance	461,67

The mean score of the 80 students on mathematical problem-solving exceeded half of the ideal maximum value. The standard deviation is 21.49, indicating that most students' math problem-solving ability scores fall within a range of points above or below the average value, calculated as average $\pm$ standard deviation, which is $54,5 - 21,49 = 33,01$ to $54,5 + 21,49 = 75,99$. Therefore, the majority of students' scores range from 33.01 to 75.99. The distribution of learning interest frequencies is depicted in Table 9.

Table 9. Frequency Distribution of Mathematical Problem-Solving Ability

Interval Nilai	Kategori	Frekuensi	Persentase (%)
Score ≥ 79	High	14	18%
$37 \leq \text{Score} < 79$	Medium	43	54%
Score < 37	Low	23	29%

If displayed in the form of a bar chart, the frequency distribution of students' interest in learning will look like Figure 3.

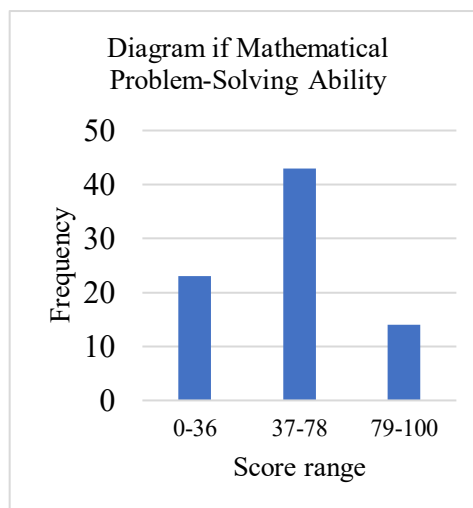


Figure 3. Frequency Distribution Diagram of Mathematical Problem-Solving Ability

The analytical findings for each indicator of mathematical problem-solving ability among tenth-grade students at MAN 1 Bone are as follows.

Based on the calculation results per indicator, class X students of MAN 1 Bone are superior in the indicator of Devising a plan with a percentage of 69%, Understanding the problem with a percentage of 60%, carrying out the plan with a percentage of 55%, and looking back 33%.

4. *Inferential Statistical Analysis*

a. *Classical Assumption Tests*

Normality testing was conducted using the Kolmogorov-Smirnov test statistical method. the analysis revealed significant of 0,200. given that both values exceeded the 0,05 significance threshold, the data from demonstrated normal distribution patterns, thereby satisfying the prerequisites for subsequent statistical analysis.

Subsequently, multicollinearity test. Multicollinearity test is to identify potential correlations among the independent variables within the regression model. the tolerance values of both variables are 0.400 (> 0.10), while the VIF values are 2.501 (< 10), indicating the absence of multicollinearity.

Following this, the heteroskedasticity test was carried out using the Glejser method. The significance values for self-efficacy and learning interest were obtained as $0.625 > 0.05$ and $0.694 > 0.05$, respectively, which means heteroscedasticity did not occur.

b. *Hypothesis Testing*

To examine the effect of the two independent variables on the dependent variable, both multiple linear regression and multiple correlation analyses were applied. The outcomes of the regression analysis are illustrated in Table 10.

Table 10. Result of the Simultaneous F-Test Analysis

Statistics	Statistical Value
R	0,719
R ²	0,516
F	41,122
Signifikansi F	0,000

As shown in Table 16, the significance value of 0.000 (< 0.05) indicates that self-efficacy and learning interest collectively affect mathematical problem-solving ability.

a correlation coefficient (R) of 0.719 was obtained, signifying a strong association between self-efficacy, learning interest, and mathematical problem-solving ability. The coefficient is positive, indicating that improvements in students' problem-solving performance accompany increases in self-efficacy and learning interest. In addition, the significance value of 0.000 (< 0.05) confirms that both independent variables are significantly related to the mathematical problem-solving ability of tenth-grade students at MAN 1 Bone.

The coefficient of determination (R²) obtained was 0.516, which signifies that self-efficacy and learning interest collectively account for 51.6% of the variance in students' mathematical problem-solving ability.

Next, the hypothesis is tested for each independent variable by performing a t-test.

Table 11. Results of the t-Test Analysis

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
(Constant)	-31,119		-3,235	0,002
<i>Self Efficacy</i>	0,715	0,431	3,437	0,001
Minat Belajar	0,651	0,331	2,645	0,010

Based on Table 11, the constant is -31.119, the self-efficacy coefficient is 0.715, and the learning interest coefficient is 0.651, so the multiple linear regression equation is as follows:

$$Y = -31,119 + 0,715X_1 + 0,651X_2$$

The self-efficacy variable obtained a significance value of 0.001 with a regression coefficient of 0.715, demonstrating its positive influence on mathematical problem-solving ability. Likewise, the learning interest variable produced a significance value of 0.010 and a regression coefficient of 0.651, confirming its positive effect on students' problem-solving skills.

The proportion of contribution from each variable, as derived from the regression and correlation coefficients, shows that self-efficacy accounts for 29.6% of problem-solving ability, while learning interest explains 22%.

5. Discussion

a. Self-efficacy

An analysis of the self-efficacy indicators revealed the condition of tenth-grade students at MAN 1 Bone excel in indicator 3 (generality) with 68%, indicating that students have widespread confidence across various activities and situations and are able to learn from experience. In indicator 2 (strength),

which shows the level of confidence in their abilities and persistence in completing tasks among class X students of MAN 1 Bone, the score is 64%. And in indicator 1 (magnitude), which reflects students' confidence and attitudes in completing tasks with varying levels of difficulty, the score is 57%.

The majority of self-efficacy scores for 10th-grade students at MAN 1 Bone for the 2024/2025 academic year fall into the moderate category. This finding indicates that only a portion of the students demonstrate strong self-efficacy in accomplishing mathematical tasks. This situation is evident from the fact that some students still feel hesitant in understanding and completing mathematical tasks, thus requiring an increase in their confidence in tackling such mathematical work. Consistent with this finding, [Utami & Wutsqa \(2017\)](#) reported that, in terms of self-efficacy, most students fall within the moderate category. This suggests that learners' confidence in studying mathematics has not yet reached an optimal level. [Sunaryo \(2017\)](#) emphasizes the importance of self-efficacy in helping students complete tasks due to the amount of effort, persistence, and composure required. Students who have an optimal level of self-efficacy are better able to manage anxiety when facing difficulties in learning mathematics. Therefore, strengthening self-efficacy is a crucial factor in improving students' problem-solving abilities.

b. Interest in Learning Mathematical

Based on the analysis of learning interest indicator results, students in class X of MAN 1 Bone are more prominent in indicator 3 (attention in learning) at 69%. In indicator 4 (involvement in learning) at 66%, and in indicator 2 (interest in learning) at 63%, as well as in indicator 1 (feeling happy) at 62%.

The majority of the interest scores of the 10th-grade students at MAN 1 Bone for the 2024/2025 academic year in mathematics fall into the moderate category. Similarly, the study by [Ndraha et al. \(2022\)](#) revealed that the average level of students' learning interest is categorized as moderate, implying that a number of learners still display limited enthusiasm toward mathematics. Individuals who have a high interest in learning can carry it out learning as best as possible so as to obtain good performance best ([Sirait, 2016](#)). Interest will encourage students to continue trying to find strategies by using all their abilities to generate innovative ideas to find solutions to mathematical problems ([Partayasa et al., 2020](#)). Therefore, a good interest in learning is an important foundation in supporting students' mathematical problem solving.

c. Mathematical Problem-Solving Ability

The analysis of mathematical problem-solving indicators shows that tenth-grade students at MAN 1 Bone excelled in indicator 2 (planning a solution) with 69%, indicating that students were more capable of creating mathematical models from a problem. In indicator 1 (understanding the problem), the score was 60%, indicates that while students demonstrated limited proficiency in identifying the given information and the questions within a problem, they were nevertheless capable of formulating its mathematical model. And in indicator 3 (executing the solution plan), the score was 55%, indicating that students still needed improvement in solving the mathematical model they had created. And for indicator 4 (rechecking), it was 33%.

The majority of the 10th-grade students at MAN 1 Bone in the 2024/2025 academic year have moderate mathematical problem-solving skills. This finding aligns with the PISA 2022 report, which noted the low ability of Indonesian students in solving contextual problems. In line with these

findings, [Asih & Ramdhani \(2019\)](#) stated that in real-world school settings, students' mathematical problem-solving abilities are classified as low. Problem-solving ability is a key aspect that students must possess ([Zakiyah et al., 2019](#)) and is a factor influencing student success during the mathematics learning process ([Nurhasanah & Luritawaty, 2021](#)). Therefore, improving students' mathematical problem-solving abilities needs to be a focus.

d. The Joint Influence of Self-Efficacy and Learning Interest on Mathematical Problem-Solving Ability

Findings from the first hypothesis test revealed that self-efficacy and learning interest collectively exert a positive and significant impact on students' mathematical problem-solving ability. Together, these two variables account for 51.6% of the variance in problem-solving performance, while the remaining 48.4% is explained by other contributing factors. From the previous explanation, it can be concluded that high self-efficacy and interest in learning are essential for improving students' mathematical problem-solving abilities. Self-efficacy and interest in learning are two factors that can influence mathematical problem-solving abilities. This means that not only self-efficacy itself but also a combination of interest in learning can maximize students' mathematical problem-solving abilities.

The findings demonstrate that self-efficacy and learning interest together have a significant influence on students' mathematical problem-solving abilities. This finding adds new insights to the educational literature, particularly because, based on a Google Scholar search using the keywords "self-efficacy," "learning interest," and "mathematical problem-solving ability," no previous research has specifically examined the combination of these two factors on students' mathematical problem-solving abilities. Furthermore, this finding not only fills a gap in existing research but also offers a new perspective that can serve as a reference for future research.

e. The Effect of Self-Efficacy on Mathematical Problem-Solving Ability

Results from the second hypothesis test indicate that self-efficacy exerts a positive and significant influence on students' mathematical problem-solving performance, contributing 29.6% to the overall ability. This finding is consistent with the study of [Zilfit et al. \(2023\)](#), which similarly demonstrated that self-efficacy positively and significantly affects mathematical problem-solving skills, with a contribution of 30.3%. Their research findings revealed that self-efficacy significantly influences mathematical problem-solving ability by 30.3%. This contrasts sharply with [Putri et al. \(2024\)](#) who stated that the effect of self-efficacy on mathematical problem-solving ability was 90.25%. This demonstrates that self-efficacy significantly influences mathematical problem-solving ability compared to other factors.

Students with high self-efficacy are less likely to experience difficulties when solving problems, and therefore, are encouraged to develop high self-efficacy ([Ismi & Lukmana, 2023](#)). Students with high self-efficacy are motivated to strive to solve math problems. This self-efficacy can build confidence in students, enabling them to solve even perceived difficulties ([Amaliyah et al., 2023](#)). Based on the foregoing explanation, it can be concluded that students with high self-efficacy are more likely to solve any problems they encounter. Therefore, it is highly recommended that each student develop and improve their mathematics self-efficacy, as it can significantly impact their mathematical problem-solving abilities.

f. The Effect of Learning Interest on Mathematical Problem-Solving Ability

Findings from the third hypothesis test reveal that learning interest exerts a positive and significant impact on students' mathematical problem-solving performance, contributing 22% to the overall ability. This result is consistent with the study by [Setyowaty et al., \(2024\)](#), which likewise demonstrated that learning interest significantly and positively influences mathematical problem-solving skills, with a contribution of 25%. Furthermore, findings conducted by [Yuliati \(2021\)](#) demonstrated a significant influence between learning interest and students' mathematical problem-solving abilities, contributing 72.5%.

A stronger interest in learning mathematics can increase students' desire and enthusiasm for learning mathematics, which in turn will influence their mathematical problem-solving abilities ([Anggraini et al., 2022](#)). From the previous explanation, it can be concluded that interest in learning mathematics is a student's fascination with mathematical material or learning. This will make students enjoy learning and facilitate their understanding of mathematical concepts. This can influence students' mathematical problem-solving abilities. Therefore, learning interest needs to be increased because it influences students' mathematical problem-solving abilities.

D. Conclusion

The study revealed that class X students at MAN 1 Bone generally exhibited moderate levels of self-efficacy, learning interest, and mathematical problem-solving ability. Furthermore, the analysis demonstrated that mathematical problem-solving skills are positively and significantly influenced both jointly and individually by self-efficacy and learning interest. Specifically, self-efficacy enhances problem-solving performance, while learning interest also contributes a meaningful positive effect.

This study can provide information regarding the influence of self-efficacy and learning interest on students' mathematical problem-solving abilities. This will enable the implementation of more effective learning models in the classroom to increase student learning interest and provide encouragement or motivation during the learning process, thereby improving student self-efficacy. In addition to self-efficacy and learning interest, other factors can influence students' mathematical problem-solving abilities. Therefore, future researchers are expected to expand this study by using other variables to identify factors that influence students' mathematical problem-solving abilities or by adding mediating variables.

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