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The Influence of Self-Efficacy, Emotional Intelligence, Learning Motivation, and Cognitive Style on Mathematics Learning Achievement of Students in Junior High School

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Abstract

This study aims to describe the effect of self-efficacy, emotional intelligence, learning motivation, and cognitive style on the mathematics learning achievement of grade VIII students at SMP Negeri 2 Parepare. This study used a quantitative approach with an ex post facto design. The population in the study amounted to 328 students in grade VIII at SMP Negeri 2 Parepare, with a sample of 172 students selected through a cluster random sampling technique, where five classes were randomly determined as population representation. The research instruments consisted of a math learning achievement test, the Group Embedded Figures Test (GEFT) to identify cognitive styles, and a questionnaire with a Likert scale to measure self-efficacy, emotional intelligence, and learning motivation. In addition, interviews were conducted with six students as complementary data to obtain more in-depth information. Data analysis was conducted using descriptive and inferential statistics through path analysis techniques. The results showed that self-efficacy, emotional intelligence, learning motivation, and cognitive style had a significant influence both directly and indirectly on mathematics learning achievement. Other findings show that the indirect effect of self-efficacy through cognitive style is greater than its direct effect on math learning achievement.

Keywords: Self-efficacy, Emotional Intelligence, Learning Motivation, Cognitive Style, Math Learning Achievement

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INTRODUCTION

Education is a basic need that every human being must have because it plays an important role in strengthening human resources, which reflects the quality of a country (Maskar & Dewi, 2021). The development of science and technology today is certainly inseparable from the influence of mathematics, which is the foundation of other scientific fields. Students from various levels of education are expected to be able to master mathematics well. Even by studying mathematics, students are expected to be able to solve all the problems they face, both those related to mathematics itself and those related to everyday life (Damayanti, 2023). However, reality shows that there are still many students who find math difficult and dislike it. They feel lackluster in learning mathematics because they have to memorize many formulas and concepts that are difficult to understand. The abstract nature of mathematics also makes them feel unsure and anxious when faced with math problems. As a result, their involvement in the math learning process is low and has an impact on their unsatisfactory learning achievement (Afifah & Kusuma, 2021).

According to the results of the TIMSS (*Trends in International Mathematics and Science Research*) study in 2015, the math skills of Indonesian students are still far below

the international average. Indonesia's average score was 397 out of 500 international average scores. This score ranks 44th out of 49 countries in the world. TIMSS is a study related to mathematics and science organized by the IEA (*International Association for the Assessment of Educational Achievement*) (Thomson et al., 2017). In addition, according to the results of the OECD (*Organisation for Economic Co-operation and Development*) study in PISA (*Programme for International Student Assessment*) in 2022, the mathematical ability of Indonesian students was ranked 70 out of 81 countries, with an average score of 366 compared to the international average score of 466 (OECD, 2023). Indonesia managed to move up 5-6 places compared to the 2018 PISA results. This is good news that shows an improvement in our education system. Despite the increase in rank, Indonesia's average score in math actually decreased. Indonesia is still below the average of other PISA participating countries, especially in math and science. This shows that there are challenges that need to be addressed to improve the quality of learning.

Educational progress can be measured through assessments given by teachers to students to show their learning achievements. One measure of success in the teaching and learning process is student achievement (Sinaga, 2022). However, students' mathematics learning achievement is still a problem that needs attention. Based on observations and interviews with one of the mathematics teachers at SMP Negeri 2 Parepare, the average semester exam score for mathematics subjects shows a lower average score compared to other subjects. Many students have difficulty understanding the basic concepts of mathematics, making them tend to give up easily and despair, especially when faced with problems that require logical reasoning. Low learning motivation and student interest in mathematics, where many students still consider mathematics a difficult and scary subject, have an impact on students' low confidence in their ability to solve mathematical problems, which can affect students' mathematics learning achievement.

Some efforts that can be made to improve the quality of learning, which is then expected to have an impact on improving students' mathematics learning achievement, are to pay special attention to the factors that influence it. Recognizing the factors that influence learning success is very important to help students achieve the best learning outcomes (Agustia, 2024). Internal factors are factors that come from within students, such as self-efficacy, emotional intelligence, learning motivation, cognitive style, and several other internal factors. While external factors are factors that come from outside the student, for example, the school social environment, such as teachers, administration, classmates, and other external factors (Wawan & Retnawati, 2022).

Self-efficacy, emotional intelligence, learning motivation, and cognitive style have a mutually influential role in influencing students' mathematics learning achievement. Self-efficacy is believed to be able to influence students' mathematics learning achievement because students who have self-efficacy are confident in their abilities, and it is this belief that encourages students' learning achievement to be better (Aalst et al., 2021). However, if not balanced with good emotional intelligence, students may have difficulty coping with stress or frustration that arises when facing difficulties. Emotional intelligence helps students manage those negative emotions, so they can stay calm and focused in the face of challenging math tasks (Agustini et al., 2024). This interaction between self-efficacy and emotional intelligence creates a strong foundation for students to be better prepared for various learning situations (Yuhaniz & Ibrahim, 2022).

Learning motivation, especially intrinsic motivation, also strengthens the relationship between self-efficacy and emotional intelligence. Students who have high learning motivation, both intrinsically and extrinsically, tend to have the drive to understand the material more deeply. This intrinsic motivation creates a positive learning

environment and allows students to explore their interests more deeply (Kusumawati, 2024). Meanwhile, different cognitive styles, such as *Field Independent* (FI) and *Field Dependent* (FD), affect the way students process and manage mathematical information. Students with an analytical FI style may find it easier to solve problems independently, whereas students with an FD style may be more effective in learning that involves social support or collaboration (Chuang et al., 2021; Hasdi et al., 2024; Zhou et al., 2023). When teaching strategies are tailored to students' cognitive styles, then self-efficacy, emotional intelligence, and learning motivation can be more optimal in improving mathematics learning achievement. Cognitive style as an intervening variable helps explain individual variation in math learning achievement.

Students' mathematics learning achievement is influenced by various interacting internal factors, such as self-efficacy, emotional intelligence, learning motivation, and cognitive style (Appiah et al., 2022; Muhtadi et al., 2022; Rahmawati & Taylor, 2023; Sagitarini et al., 2023; Sinaga, 2022; Udiyono & Yuwono, 2018; Ugwuanyi, 2020; Yasa et al., 2013). These four factors play an important role in the learning process, but research that examines all these variables simultaneously is still relatively rare, especially at the junior high school level. This research offers a novelty by building an analytical model that combines these four aspects in a complete study framework, thus providing a more comprehensive picture of the determinants of mathematics learning achievement. The approach used is quantitative with an ex post facto design, and uses path analysis to identify direct and indirect relationships between variables. This study also enriches the educational literature through the local context raised, namely class VIII students of SMP Negeri 2 Parepare, which has not been used as a similar research location. In addition to using standardized instruments that have been validated, this research is also complemented by interviews with selected students to provide additional perspectives. Thus, the results of this research are expected to be the basis for developing learning strategies that are more adaptive to the characteristics of each student and based on a strong psychological understanding.

METHODS

The research used is quantitative research with a causal ex-post facto approach. Ex post facto research is research on facts in the field. This study explains the causal relationship between self-efficacy (X_1), emotional intelligence (X_2), learning motivation (X_3), and cognitive style (Y) on math learning achievement (Z). This research was conducted at SMP Negeri 2 Parepare, Parepare City, South Sulawesi Province, in the even semester of the 2024/2025 school year. The population in this study was all VIII grade students of SMP Negeri 2 Parepare in the 2024/2025 school year, consisting of 10 classes, totaling 328 students. The sampling technique used in this study was a cluster random sampling technique, so that five classes, totaling 172 students, were selected as research samples. The instruments used were (1) self-efficacy questionnaire, (2) emotional intelligence questionnaire, (3) learning motivation questionnaire, (4) GEFT cognitive style test, and (5) mathematics learning achievement test, odd semester material grade VIII. In addition, interviews were also conducted with six students to obtain additional information about self-efficacy, emotional intelligence, and learning motivation. The research data analysis was conducted using the path analysis technique with the help of the SPSS version 25.0 program. Path analysis was used to determine the magnitude of direct and indirect effects between variables of self-efficacy, emotional intelligence, learning motivation, and cognitive style on math learning achievement. Before path analysis, the data were first tested through statistical assumption tests, which

included normality tests, multicollinearity tests, and heteroscedasticity tests. Path analysis results are reported in the form of path coefficients, significance values, and the amount of direct and indirect effects between variables. Interpretation is based on a significance value of $p < 0.05$.

RESULTS & DISCUSSION

Results

1. Descriptive Statistics Analysis Results

a. Self-efficacy

The results of descriptive analysis related to the score of the self-efficacy variable of class VIII students of SMP Negeri 2 Parepare can be seen in Table 1.

Table 1. Self-efficacy Score Statistics

Data	Analysis Result
Mean	58,28
Median	58,00
Mode	58,00
Std. Deviation	5,58
Variance	31,19

Based on Table 1, it is known that the average value of student self-efficacy is 58.28, which indicates that the average student self-efficacy is in the moderate category. The median is 58.00 with a standard deviation and variance of 5.58 and 31.19, respectively.

Table 2. Frequency Distribution and Percentage of Self-Efficacy Score

Value Interval	Category	Frequency	Percentage (%)
$X < 49,91$	Very Low	8	4,7 %
$49,91 \leq X < 55,49$	Low	47	27,3 %
$55,49 \leq X < 61,08$	Medium	65	37,8 %
$61,08 \leq X < 66,66$	High	45	26,2 %
$X \geq 66,66$	Very High	7	4,1 %
Total		172	100,0 %

Based on Table 2, it can be concluded that the self-efficacy of students of SMP Negeri 2 Parepare is divided into five categories. A total of 8 students (4.7% of 172 students) had self-efficacy in the very low category, 47 students (27.3% of 172 students) were in the low category, 65 students (37.8% of 172 students) were in the medium category, 45 students (26.2% of 172 students) were in the high category, and seven students (4.1% of 172 students) were in the very high category.

b. Emotional intelligence

From the data analysis, the statistics of emotional intelligence scores and the frequency distribution of emotional intelligence are as follows:

Table 3. Emotional Intelligence Score Statistics

Data	Analysis Result
Mean	83,91
Median	84,00
Mode	83,00
Std. Deviation	6,90
Variance	47,60

Based on Table 3, it is known that the average score of students' emotional intelligence is 83.91, which indicates that the average emotional intelligence of students is in the moderate category. The median is 84.00 with a standard deviation and variance of 6.90 and 47.60, respectively.

Table 4. Frequency and Percentage Distribution of Emotional Intelligence Score

Value Interval	Category	Frequency	Percentage (%)
$X < 73,56$	Very Low	11	6,4 %
$73,56 \leq X < 80,46$	Low	41	23,8 %
$80,46 \leq X < 87,36$	Medium	64	37,2 %
$87,36 \leq X < 94,26$	High	48	27,9 %
$X \geq 94,26$	Very High	8	4,7 %
Total		172	100,0 %

Based on Table 4, it can be concluded that the emotional intelligence of students of SMP Negeri 2 Parepare is divided into five categories. A total of 11 students (6.4% of 172 students) have emotional intelligence in the very low category, 41 students (23.8% of 172 students) are in the low category, 64 students (37.2% of 172 students) are in the medium category, 48 students (27.9% of 172 students) are in the high category, and eight students (4.7% of 172 students) are in the very high category.

c. Learning motivation

From the data analysis, the statistics of learning motivation scores and the frequency distribution of learning motivation are as follows:

Table 5. Learning Motivation Score Statistics

Data	Analysis Result
Mean	73,38
Median	73,00
Mode	73,00
Std. Deviation	5,90
Variance	34,81

Based on Table 5, it is known that the average value of student learning motivation is 73.38, which shows that the average student learning motivation is in the moderate category. The median is 73.00 with a standard deviation and variance of 5.90 and 34.81, respectively.

Table 6. Frequency and Percentage Distribution of Learning Motivation

Value Interval	Category	Frequency	Percentage (%)
$X < 64{,}53$	Very Low	9	5,2 %
$64{,}53 \leq X < 70{,}43$	Low	42	24,4 %
$70{,}43 \leq X < 76{,}33$	Medium	68	39,5 %
$76{,}33 \leq X < 82{,}23$	High	45	26,2 %
$X \geq 82{,}23$	Very High	8	4,7 %
Total		172	100,0 %

Based on Table 6, it can be concluded that the learning motivation of students of SMP Negeri 2 Parepare is spread across five categories. A total of 9 students (5.2% of 172 students) have learning motivation in the very low category, 42 students (24.4% of 172 students) are in the low category, 68 students (39.5% of 172 students) are in the medium category, 45 students (26.2% of 172 students) are in the high category, and eight students (4.7% of 172 students) are in the very high category.

d. Cognitive style

From the data analysis, the statistics of cognitive style scores and the frequency distribution of cognitive style are as follows:

Table 7. Frequency Distribution of Cognitive Styles

Interval	Category	Frequency	Percentage (%)
$0 \leq X \leq 11$	*Field Dependent* (FD)	128	74,4 %
$12 \leq X \leq 18$	*Field Independent* (FI)	44	25,6 %
Total		172	100,00 %

Table 7 shows that the mean value of the cognitive style of students amounted to 9.58 of the ideal value of 18.00, which indicates that the distribution of the cognitive style of students in class VIII SMP Negeri 2 Parepare tends to have the FD cognitive style. In addition, it is also known that as many as 128 students (74.4% of 172 students) have FD cognitive style and as many as 44 students (25.6% of 172 students) have FI cognitive style.

Table 8. Descriptive Statistics Based on FD Cognitive Style

Variables	Mean	Std. Deviation	Minimum	Maximum
Self-efficacy	56,44	4,70	44,00	66,00
Emotional intelligence	81,80	5,82	68,00	98,00
Learning motivation	71,07	4,72	59,00	82,00
Math Learning Achievement	53,84	18,66	18,18	100,00

Based on Table 8, it can be concluded that in the FD cognitive style, the average self-efficacy score is 56.44 with a standard deviation of 4.70, a minimum value of 44.00, and a maximum of 66.00. On average, the emotional intelligence was 81.80 with a standard deviation of 5.82, a minimum value of 68.00, and a maximum value of 98.00. Furthermore, the average learning motivation is 71.07 with a standard deviation of 4.72, a minimum value of 59.00, and a maximum value of 82.00. Meanwhile, the average math learning achievement was 53.84 with a standard deviation of 18.66, a minimum value of 18.18, and a maximum value of 100.00.

Table 9. Descriptive Statistics Based on FI Cognitive Style

Variables	Mean	Std. Deviation	Minimum	Maximum
Self-efficacy	63,66	4,36	47,00	71,00
Emotional intelligence	90,05	6,12	69,00	100,00
Learning motivation	80,09	3,28	74,00	87,00
Math Learning Achievement	87,81	8,75	72,73	100,00

Based on Table 9, it can be concluded that in the FI cognitive style, the average self-efficacy score is 63.66 with a standard deviation of 4.36, a minimum value of 47.00, and a maximum of 71.00. On average, the emotional intelligence was 90.05 with a standard deviation of 6.12, a minimum value of 69.00, and a maximum value of 100.00. Furthermore, the average learning motivation is 80.09 with a standard deviation of 3.28, a minimum value of 74.00, and a maximum value of 87.00. Meanwhile, the average math learning achievement was 87.81 with a standard deviation of 8.75, a minimum value of 72.73, and a maximum value of 100.00.

e. Math learning achievement

From the data analysis, the statistics of math learning achievement scores and the frequency distribution of math learning achievement are as follows.

Table 10. Statistics of Mathematics Learning Achievement Score

Data	Analysis Result
Mean	62,53
Median	63,64
Mode	81,82
Std. Deviation	22,34
Variance	499,05

Table 11. Frequency and Percentage Distribution of Math Learning Achievement Score

Value Interval	Category	Frequency	Percentage (%)
0 – 40,99	Very Low	38	22,1 %
41,00 – 60,99	Low	37	21,5 %
61,00 – 75,99	Medium	43	25,0 %
76,00 – 90,99	High	42	24,4 %
91,00 – 100,00	Very High	12	7,0 %
Total		172	100,00 %

Based on tables 10 and 11, it is known that the average score of students' mathematics learning achievement is 62.53 from the ideal score of 100.00, which indicates that the mathematics learning achievement of students of SMP Negeri 2 Parepare is in the moderate category. The analysis results also show that the standard deviation value is 22.34. In addition, it is known that 38 students (22.1% of 172 students) have math learning achievement in the very low category, 37 students (21.5%) are in the low category, 43 students (25.0%) are in the medium category, 42 students (24.4%) are in the high category, and 12 students (7.0%) are in the very high category.

2. Results of Inferential Statistical Analysis

a. Normality test

Test the normality of the data to determine whether the data used is normally distributed or not. In this study, the normality test used the *Kolmogorov-Smirnov* test.

Table 12. Normality Test Results

Class	*Kolmogorov Smirnov*			Description
	Statistic	df	Sig.	
Unstandardized Residual 1	0,038	172	0,200	Normally distributed
Unstandardized Residual 2	0,039	172	0,200	Normally distributed

The normality test results in Table 12 using the Kolmogorov-Smirnov method show that the significance value for *Unstandardized Residual 1* and *Unstandardized Residual 2* are both 0.200. Because this value is greater than 0.05, the data is considered normally distributed. This means that both types of residuals meet the normality requirements.

b. Multicollinearity test

A multicollinearity test is conducted to determine whether there are independent variables that are correlated or not.

Table 13. Multicollinearity Test Results

Variables	*Collinearity Statistics*		Description
	Tolerance	VIF	
Self-efficacy	0,239	4,192	No multicollinearity
Emotional intelligence	0,365	2,737	No multicollinearity
Learning motivation	0,212	4,709	No multicollinearity
Cognitive style	0,199	5,022	No multicollinearity

Based on the multicollinearity test results presented in Table 13, all independent variables show a *tolerance* value above 0.10 and a *Variance Inflation Factor* (VIF) value <10. In detail, self-efficacy has a *tolerance of* 0.239 with a VIF of 4.192; emotional intelligence of 0.365 with a VIF of 2.737; learning motivation of 0.212 with a VIF of 4.709; and cognitive style of 0.199 with a VIF of 5.022. Referring to the multicollinearity test criteria, the *tolerance* value> 0.10 and VIF < 10 indicate that there is no high correlation between the independent variables. Thus, it can be concluded that there are no multicollinearity symptoms in the regression model used in this study.

c. Heteroscedasticity test

The heteroscedasticity test is carried out to detect the existence of inequality in the *variance* of the regression model residuals in one observation. A good regression model has a fixed variance (homoscedasticity) or no symptoms of heteroscedasticity.

Table 14. Heteroscedasticity Test Results

Variables	Sig.	Description
Self-efficacy	0,540	No heteroscedasticity
Emotional intelligence	0,908	No heteroscedasticity
Learning motivation	0,739	No heteroscedasticity
Cognitive style	0,668	No heteroscedasticity

Based on Table 14, all independent variables show a significance value that exceeds 0.05. In more detail, self-efficacy has a significance value of 0.540; emotional intelligence of 0.908; learning motivation of 0.739; and cognitive style of 0.668. Referring to the test criteria, a significance value above 0.05 indicates that there is no statistically significant effect of the independent variables on the *absolute* value of the *unstandardized residual* (ABS). Thus, it can be concluded that the regression model used in this study does not indicate any symptoms of heteroscedasticity, and the assumption of homoscedasticity is fulfilled.

d. Hypothesis testing

1) Model path coefficient I

Based on the results of the analysis, the following path coefficient table is presented to determine the effect of self-efficacy (X_1), emotional intelligence (X_2), and learning motivation (X_3) on cognitive style (Y) presented in Table 15.

Table 15. Path Coefficients Model I

Variable	*Standardized Coefficient* Beta	Sig. *Coefficient*	R^2
Self-efficacy (X_1)	0,275	0,000	0,801
Emotional intelligence (X_2)	0,116	0,042	
Learning motivation (X_3)	0,563	0,000	

Based on the results of the analysis in Table 15, the path coefficient values of the effects of self-efficacy, emotional intelligence, and learning motivation on cognitive style are 0.275, 0.116, and 0.563, respectively. In addition, the significance value for each variable is 0.000, 0.042, and 0.000. Because the value of Sig. <0.05, it can be concluded that self-efficacy, emotional intelligence, and motivation to learn have a significant influence on cognitive style.

Then, the value of R2 of 0.801, which means that the variables of self-efficacy, emotional intelligence, and motivation to learn together contribute 80.1% in explaining changes that occur in cognitive style variables, while other variables outside the model explain the remaining 19.9%. While the value for ε1 is calculated by using the formula $\sqrt{1 - R^2}$ so that the value $\varepsilon_1 = \sqrt{1 - 0{,}801} = \sqrt{0{,}199} = 0{,}446$.

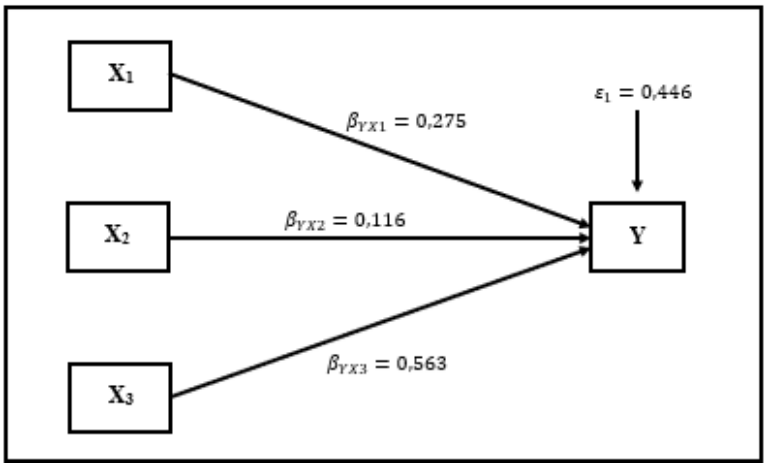

Figure 1. Path Design Model I

Structural equation I in this study is as follows:

$$Y = 0{,}275X_1 + 0{,}116X_2 + 0{,}563X_3 + 0{,}446$$

Description:
X_1 : Self-efficacy
X_2 : Emotional intelligence
X_3 : Learning motivation
Y : Cognitive style
Z : Math learning achievement

1) Model II path coefficient

Based on the results of the analysis, the following path coefficient table is presented to determine the effect of self-efficacy variables (X_1), emotional intelligence (X_2), learning motivation (X_3), and cognitive style (Y) on math learning achievement (Z) presented in Table 16.

Table 16. Path Coefficient Model II

Variable	*Standardized Coefficient* Beta	Sig. Coefficient	R^2
Self-efficacy (X_1)	0,122	0,011	0,910
Emotional intelligence (X_2)	0,108	0,005	
Learning motivation (X_3)	0,322	0,000	
Cognitive Style (Y)	0,466	0,000	

Based on the results of the analysis in Table 16, the path coefficient values of the effect of self-efficacy, emotional intelligence, learning motivation, and cognitive style on math learning achievement are 0.122, 0.108, 0.322, and 0.466, respectively. In addition, the significance value for each variable is 0.011, 0.005, 0.000, and 0.000.

Then, the value of R2 is 0.910, which means that the variables of self-efficacy, emotional intelligence, learning motivation, and cognitive style have a contribution of 91.0% in explaining the changes that occur in the math learning achievement variable, while other variables outside the model explain the remaining 9.0%. While the value for ε2 is calculated using the formula $\sqrt{1 - R^2}$ so that the value $\varepsilon_2 = \sqrt{1 - 0{,}910} = \sqrt{0{,}090} = 0{,}300$.

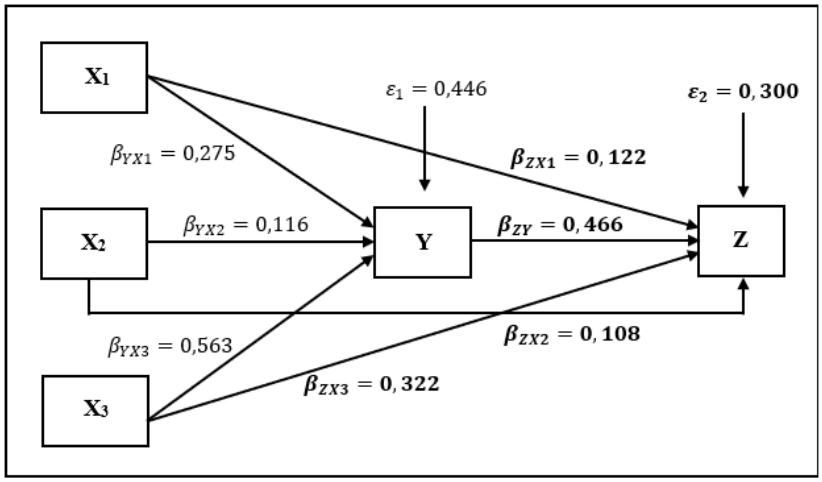

Figure 2. Path Design Model II

Structural equation II in this study is as follows:

$$Z = 0{,}122X_1 + 0{,}108X_2 + 0{,}322X_3 + 0{,}466Y + 0{,}300$$

Description:
X_1 : Self-efficacy
X_2 : Emotional intelligence
X_3 : Learning motivation
Y : Cognitive style
Z : Math learning achievement

Discussion

1. Characteristics of Each Variable

Based on the results of the previous data analysis, it is known that student self-efficacy has an average score of 58.28. In general, the self-efficacy of VIII grade students of SMP Negeri 2 Parepare is in the moderate category, namely in the score range of 55.24 to 61.13, with 65 students (37.8% of the total 172 students). Students' emotional intelligence has an average score of 83.91. In general, the emotional intelligence of students in class VIII of SMP Negeri 2 Parepare is in the moderate category, namely in the score range of 80.33 to 87.39, with 64 students (37.2% of the total 172 students). Student learning motivation has an average score of 73.38. In general, the learning motivation of grade VIII students of SMP Negeri 2 Parepare was in the moderate category, namely in the range of scores 70.43 to 76.33, with a total of 68 students (39.5% of a total of 172 students). The cognitive style of students in grade VIII SMP Negeri 2 Parepare tends to be more dominant in the FD category. This is indicated by the mean value of cognitive style of 9.58 of the ideal value of 18.00. In addition, the frequency distribution showed that 128 students (74.4%) had FD cognitive style while 44 students (25.6%) had FI cognitive style. Students' mathematics learning achievement had an average score of 63.08. In general, the mathematics learning achievement of grade VIII students of SMP Negeri 2 Parepare was in the moderate category, namely in the range of 61.00-75.99, with a total of 43 students (25.0% of the total 172 students).

2. The Effect of Self-Efficacy on Mathematics Learning Achievement

The results of path analysis show that self-efficacy has a direct influence on students' mathematics learning achievement. The standardized beta coefficient value of 0.122 with a significance of 0.011, which is smaller than 0.05, indicates that the effect is statistically significant. That is, if self-efficacy increases by one standard deviation unit, then students' mathematics learning achievement will increase by 12.2%, assuming other variables remain constant. This finding shows that self-efficacy is one of the important factors that can encourage the improvement of student learning achievement, especially in mathematics subjects.

Students who have high self-efficacy will have confidence in completing academic tasks more easily and achieving better results (Mubaroh & Somawati, 2024). In addition, increasing self-efficacy can also be supported through positive interactions with teachers during the learning process, Pratiwi & Rozali (2021) Emphasize that interactions between students and teachers can provide motivational encouragement that has an impact on increasing self-efficacy, which ultimately contributes to improving academic achievement.

From the results of the interview, it can be concluded that self-efficacy is an important factor in determining learning achievement, but not the only influential factor. High self-efficacy needs to be balanced with a good learning strategy, discipline in

learning, and accuracy in working on problems. Conversely, even if a student has low self-efficacy, support from the environment, the right learning strategy, and consistent effort can help improve learning achievement. Therefore, learning approaches that encourage self-efficacy and effective learning strategies need to be implemented to help students achieve optimal academic results.

3. The Effect of Emotional Intelligence on Mathematics Learning Achievement

Based on the results of path analysis, it was found that students' emotional intelligence has a direct influence on mathematics learning achievement. This is indicated by the standardized beta coefficient value of 0.108 or 10.8%, with a significance value of 0.005, which is smaller than 0.05. This means that every one standard deviation increase in students' emotional intelligence will increase math learning achievement by 10.8%, assuming other variables remain constant. Although the effect is smaller than other variables, this result shows that emotional intelligence contributes to improving student learning achievement.

Emotional intelligence refers to a person's ability to recognize, manage, and utilize their emotions effectively, especially when facing learning challenges. Some previous studies conducted by Ihsan et al. (2024) and Safa'udin & Hima (2024) show that emotional intelligence has a positive and significant effect on math learning achievement. Students who have high emotional intelligence tend to be more focused, persistent, and confident in facing academic challenges (Mulyati et al., 2025). This is because they are able to manage stress, maintain motivation, and use their emotions positively to understand the material better. In contrast, students with low emotional intelligence often have difficulty controlling their emotions, which ultimately results in suboptimal learning outcomes.

From the interviews, it can be concluded that emotional intelligence plays an important role in the learning process, but it is not the only factor that determines academic achievement. Students with high emotional intelligence tend to be better able to manage stress and support their friends in learning. However, if not accompanied by effective study strategies, their academic achievement may not be optimal. Conversely, students with low emotional intelligence but strong determination and good study strategies can still achieve high academic results. Therefore, educators need to help students develop their emotional intelligence while guiding more effective study strategies in order to achieve maximum results.

4. The Effect of Learning Motivation on Mathematics Learning Achievement

Based on the results of path analysis, it was found that student learning motivation has a direct effect on mathematics learning achievement. This is indicated by the standardized beta coefficient value of 0.322 or 32.2%, with a significance value of 0.000, which is smaller than 0.05. This means that every one-unit increase in student learning motivation will increase mathematics learning achievement by 0.322 standard deviations, assuming other variables remain constant. This means that every one-unit increase in student learning motivation will increase math learning achievement by 0.322 standard deviations, assuming other variables remain constant. These results indicate that learning motivation has a significant contribution to improving student achievement.

High learning motivation is very important, especially in learning mathematics, because students who have high learning motivation will show interest, confidence, and perseverance in understanding and solving math problems. Thus, they will be more focused and try to understand the material well, which in turn will have a positive impact on their learning outcomes (Mukti et al., 2022). Students who have high learning motivation will not be quickly satisfied with what they get and always have the curiosity

to deepen their understanding. If they encounter difficulties, these students will make every effort to find solutions to the problems they face (A. N. Sari et al., 2023).

From the interview results, it can be concluded that high learning motivation needs to be balanced with effective learning strategies in order to produce optimal academic achievement. Students with low motivation but efficient learning strategies can still achieve good learning outcomes, while students with high motivation but inappropriate strategies may still experience difficulties in achieving maximum performance. Therefore, a learning approach that adapts to students' needs and characteristics is necessary to maximize their learning outcomes.

5. The Effect of Cognitive Style on Mathematics Learning Achievement

Based on the results of path analysis, it is known that students' cognitive style has a direct effect on mathematics learning achievement. This is reflected in the standardized beta coefficient value of 0.466 or 46.6%, with a significance value of 0.000, which is smaller than 0.05. This means that any increase in students' cognitive style in understanding and processing information will increase mathematics learning achievement by 0.466 standard deviations, assuming other variables remain constant. That is, any increase in students' cognitive style in understanding and processing information will increase math learning achievement by 0.466 standard deviations, assuming other variables remain constant. These findings indicate that cognitive style has a significant influence on students' mathematics learning achievement.

The results of this study confirm that cognitive style plays an important role in the process of learning mathematics, especially in the way students understand concepts, solve problems, and apply the knowledge gained. In addition, the results of research conducted by Sutama et al. (2021) found that there were differences in problem-solving skills in students with FI and FD cognitive styles, which then affected their mathematics learning achievement. FI students who are more analytical and independent tend to have higher learning achievement because they are able to understand mathematical concepts deeply and develop problem-solving strategies effectively. They can solve problems more systematically and accurately, thus improving academic achievement. In contrast, FD students who rely more on external guidance often have difficulty connecting concepts and overlook important details in the problem-solving process, which can hinder understanding and result in lower learning achievement (Almulla & Al-Rahmi, 2023). Students with FI cognitive style tend to think analytically and are able to break down complex problems into simpler parts, thus facilitating a deeper understanding of basic concepts in mathematics. In contrast, students with FD cognitive style often have difficulty with various mathematical concepts and rely more on external help to understand the material in learning (Jannah et al., 2024).

6. The Effect of Self-Efficacy on Mathematics Learning Achievement Through Cognitive Style

Based on the results of data processing using path analysis, it is known that student self-efficacy has an indirect effect on math learning achievement through cognitive style, as indicated by the path coefficient value of $0.275 \times 0.466 = 0.128$ or 12.8%. This means that the higher the student's self-efficacy, the greater the influence on improving math learning achievement through cognitive style. Although the effect is not as great as the direct effect of other variables, these results indicate that cognitive style acts as a mediator in the relationship between self-efficacy and math learning achievement, so that the indirect effect through cognitive style is better than the direct effect. Furthermore, research by Ratnaningsih et al. (2020) stated that cognitive style plays an important role in determining how students understand and process mathematical

information. The results of this study are in line with the findings of Putri et al. (2024), which showed that self-efficacy has a significant relationship with students' cognitive strategies in understanding mathematical concepts. Students who have high self-efficacy are more confident in facing learning challenges, more active in analyzing problems, looking for relationships between concepts, and applying more effective problem-solving strategies. In addition, research by Sari et al. (2024) revealed that cognitive style acts as a mediator in the relationship between psychological variables and math learning achievement. In other words, high self-efficacy not only has a direct impact on learning outcomes but also indirectly through cognitive style, which helps students organize information and develop more optimal learning strategies.

7. The Effect of Emotional Intelligence on Mathematics Learning Achievement Through Cognitive Style

Based on the results of path analysis, it is known that students' emotional intelligence provides an indirect influence on math learning achievement through intermediary variables, namely, cognitive style. The magnitude of the indirect effect is indicated by the product of the path coefficient, which is $0.108 \times 0.466 = 0.050$ or 5.0%. This finding indicates that the higher the emotional intelligence of students, the greater the contribution to improving math learning achievement indirectly through an increase in cognitive style.

Research by Anggraini et al. (2022) showed that emotional intelligence has a positive influence on math learning outcomes by 68.60%. Students with high emotional intelligence are better able to manage emotions, maintain focus, and develop effective thinking strategies in understanding math concepts. Conversely, students with low emotional intelligence tend to have difficulty in optimizing their cognitive style, which can have an impact on low learning achievement. The effect of emotional intelligence on mathematics learning outcomes can vary depending on students' cognitive styles. FI students are more independent in thinking, have good emotional control, and are able to organize their learning strategies. With good emotional intelligence, they can cope with academic pressure and stay focused on completing math tasks. Meanwhile, FD students are more dependent on external guidance. However, if they have high emotional intelligence, they can better manage stress, receive positive feedback, and increase their motivation to learn. Thus, math learning should not only focus on cognitive aspects, but also on developing students' emotional intelligence. With this strategy, students can optimally utilize their cognitive style and improve their mathematics learning outcomes. Therefore, mathematics learning should not only focus on cognitive aspects, but also develop students' emotional intelligence through strategies such as strengthening emotion regulation, improving adaptation skills, and providing support in dealing with academic pressure.

8. The Effect of Learning Motivation on Mathematics Learning Achievement Through Cognitive Style

Based on the results of path analysis, it is known that students' emotional intelligence provides an indirect influence on math learning achievement through cognitive style. The magnitude of the effect is indicated by the product of the path coefficient, which is $0.563 \times 0.466 = 0.262$ or 26.2%. This shows that the higher the level of emotional intelligence of students, the greater the contribution to improving math learning achievement through an increase in cognitive style as a mediating variable.

In addition, the results of this study are also in accordance with the findings of Cahyani et al. (2023), which showed a significant relationship between learning motivation and math learning achievement. High learning motivation can help students

understand math concepts better, increase perseverance in solving problems, and build confidence in facing academic challenges. Therefore, in an effort to improve learning achievement, a strategy is needed to foster and maintain student learning motivation. In addition, the feedback model in learning mathematics is also proven to affect student learning motivation. The results of Mertasari (2020) research showed that students who received feedback from peers had higher learning motivation compared to students who received feedback from teachers.

Based on these findings, it is recommended that the application of peer feedback be used as one of the learning strategies to increase students' learning motivation in mathematics. However, in its implementation, it is important to pay attention to differences in students' cognitive styles to ensure the effectiveness of the applied strategy. A more adaptive approach can be done through a combination of peer and teacher feedback, so that all students, both those with FI and FD cognitive styles, can optimally benefit in improving their motivation and mathematics learning achievement.

CONCLUSION

Based on the research results and discussions, the following conclusions were obtained: (1) The level of self-efficacy of class VIII students at SMP Negeri 2 Parepare is in the moderate category, (2) The level of students' emotional intelligence is in the moderate category, (3) Students' learning motivation is also in the moderate category. (4) Students' cognitive style tends towards the field dependent (FD) category, (5) The mathematics learning achievement of class VIII students is generally in the moderate category, (6) Self-efficacy has a direct influence on mathematics learning achievement at a significance level of 5%, (7) Emotional intelligence has a direct influence on mathematics learning achievement at a significance level of 5%, (8) Learning motivation has a direct influence on mathematics learning achievement at a significance level of 5%, (9) Cognitive style has a direct influence on mathematics learning achievement at a significance level of 5%, (10) Self-efficacy has an indirect influence on mathematics learning achievement through cognitive style at a significance level of 5%, (11) Emotional intelligence has an indirect influence on mathematics learning achievement through cognitive style at a significance level of 5%, (12) Learning motivation has an indirect influence on mathematics learning achievement through cognitive style at a significance level of 5%, (13) The indirect influence of self-efficacy on mathematics learning achievement through cognitive style is greater than its direct influence, (14) The direct influence of emotional intelligence on mathematics learning achievement is greater than its indirect influence through cognitive style, (15) The direct influence of learning motivation on mathematics learning achievement is greater than its indirect influence through cognitive style.

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