THE INFLUENCE OF MATHEMATICAL DISPOSITION, SELF-EFFICACY, AND LEARNING MOTIVATION ON MATHEMATICS LEARNING ACHIEVEMENT

Baso Intang Sappaile
Universitas Negeri Makassar
Corespondensi author email: baso.sappaile@unm.ac.id

Norma Nasir
Universitas Negeri Makassar

Miske Elsy Sibian
IPEKA CPI Christian School Makassar

Abstract

This research is a researchex_post facto which aims to determine the influence of mathematical disposition, self-efficacy, and learning motivation. The research population was all students of class X of Madrasah Alyiah Arifah Gowa. Sampling using the techniquerandom sampling. The instrument consists of a scale (mathematical disposition, self-efficacy, and learning motivation) and a mathematics learning achievement test. The research data were analyzed using descriptive statistics and inferential statistics using multiple regression. The results of the study showed that, statistically descriptively: 1) students' mathematical disposition is in the high category; 2) students' self-efficacy and learning motivation are each in the medium category. Statistically inferentially: 1) mathematical disposition, self-efficacy, and learning motivation together have a relationship with the mathematics learning achievement test with Fcount = 18.50 and p_value = 0.0001 < α = 0.005 and the determination coefficient is 49%; 2) partially: (1) mathematical disposition does not have a positive relationship with mathematics learning achievement with tcount = -0.18 and p-value = 0.431 > α = 0.005; (2) self-efficacy has a positive relationship with mathematics learning performance with tcount = 2.96 and p_value = 0.0025 < α = 0.005; (3) learning motivation has a positive relationship with mathematics learning achievement with tcount = 2.90 and p_value = 0.0025 < α = 0.005.

Keywords: *Mathematical Disposition, Self-Efficacy, Learning Motivation, and Mathematics Learning Achievement.*

INTRODUCTION

Mathematics is dubbed as a basic and deductive science. This is because the essence of mathematics is the basis of all disciplines. This statement is in line with Hudojo (2001) who stated that mastery of mathematics is the main key in mastering science and technology. Even the importance of mathematics is also stated by Skemp (1971) that "mathematics is also a valuable and general purpose technique for satisfying other needs. It is widely known to be an assential tool for science, technology, and commerce; and for entry to many prefessions". Based on this, the

existence of mathematics is considered essential for human life in various fields including education.

The implementation of mathematics learning in schools reflects the existence of this essential mathematics. If reviewed further, it is found that in every curriculum, mathematics learning is always taught at every level from early childhood education to advanced education. One of the factors that mathematics education must have for every individual is that mathematics plays a role in forming superior human resources, having the ability to think logically, critically, systematically, rationally, and accurately; having the ability to be honest, objective, creative, and open. This is based on the Agency for Standards, Curriculum, and Education Assessment of the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia (2022) which states that learning mathematics can improve students' abilities to think logically, analytically, systematically, critically, and creatively. Mathematics equips students with how to think, reason, and be logical.

The importance of the role of mathematics in human life is not supported by the facts that occur in the field. Currently, especially in Indonesia, the achievement of secondary school students in mathematics is still very low. The results of the TIMSS studyTrend Mathematics and Science Study (2015) revealed that the mathematics ability of junior high school students in Indonesia was ranked 46th out of 61 countries with an average of 397. This is far below the international average. Not much different from that, the results of PISA (Programme for International Student Assessment) in 2018 (OECD, 2019) showed that among the 79 participating countries, Indonesia was ranked 73rd for mathematics ability with an average score of 379. This score is below the average for ASEAN students. Tafano and Zega's (2023) research also supports this, by revealing that high school students' mathematics learning achievement is still very low.

The decline in students' mathematics learning achievement at Madrasah Aliyah Arifah Gowa over the past two years has become a major concern. Based on the results of interviews with grade X mathematics teachers, there was a decline in student performance compared to previous years. This can be seen from the students' ability to complete six topics that should have been completed in the odd semester, but only four topics could be realized. Teachers need to adjust students' declining cognitive abilities, which are thought to be caused by the phenomenonlearning loss or a significant decline in learning over a period of time.

In the context of learning mathematics, several topics are very important to form the basis of students' understanding in solving complex mathematical problems. Materials such as Exponentials, Sequences and Series, Systems of Linear Equations in Three Variables, and Quadratic Equations and Functions are not only an integral part of the curriculum, but also play an important role in the development of critical thinking and problem-solving skills.

The Three-Variable Linear Equation System is also no less important. This material is essential for understanding how to solve problems with multiple variables, which is an essential skill in many applied sciences, including engineering and computer science. Understanding the linear equation system helps students in modeling and solving real-world problems involving multiple parameters (Blitzer, 2017). Meanwhile, Quadratic Equations and Functions are essential in modeling and solving various real-world problems, from physics to economics. Quadratic functions are often used to predict outcomes and understand relationships between variables (Blitzer, 2017). With the importance of these materials, the decline in students' ability to master this subject matter directly impacts their mathematics learning achievement. Therefore, it is important to conduct further research on the factors that influence mathematics learning achievement. Several factors that also affect a person's learning, and are classified into two parts, namely internal and external factors. The internal factors themselves can be in the form of students' readiness and maturity in responding to mathematics and students' perceptions of mathematics.

Talking about students' readiness and perceptions also means talking about students' attitudes towards mathematics itself. Supianti, Yaniawati, Ramadhan, Setyaji, and Puspitasari, (2022) stated, "Disposition of mathematics is a strong drive, conscious, or tendency to study mathematics and behave positively in solving mathematical problems". Mathematical disposition is more directed at students' positive attitudes towards mathematics itself.

The importance of mathematical disposition is also stated in (Permendikbud, 2016) where the competency of learning mathematics attitudes for elementary, middle, and high school/Islamic high schools/Islamic vocational high schools/Islamic vocational high schools are (1) showing a positive attitude in mathematics: logical, careful and precise, honest, responsible, and not easily giving up in solving problems, and (2) Having curiosity, continuous enthusiasm for learning, self-confidence, and interest in mathematics, which are formed through learning experiences. Meanwhile, the competency of knowledge and skills is (1) using patterns to explain long-term trends and using them in real-world contexts, and utilizing them in problem solving or arguing and (2) the ability to communicate mathematical ideas clearly. In order for students to master the competency of knowledge and skills, positive mathematical attitude or disposition competence is needed.

One of the internal factors that determines the level of student learning achievement is self-efficacy orself-efficacy. Self-efficacyis a belief that students must have in order to succeed in the learning process (Sunaryo, 2017). Sawtelle, Brewe, and Kramer (2012), define self-efficacy as self-confidence in one's own abilities in carrying out certain roles or tasks. According to Utami and Wutsqa, (2017),self-efficacyin mathematics can be interpreted as students' belief in their ability to work on mathematical problems and complete mathematical assignments.

According to Bandura (2006), students' beliefs about their mathematical abilities influence students to choose activities and regulate attitudes, levels of independence in dealing with problems. This is in line with the statement of Baihaki, Maknun, and Nurmeidina (2022) which states that students who haveself-efficacy high will make students have motivation, sincerity and perseverance in doing assignments, this will greatly affect the process of solving the given mathematical problems so that it will also affect student learning achievement. The importance ofself-efficacy This is also stated by Ghufron and Risnawita (2014) that self-efficacy is one aspect of an individual that is very influential in his life. This is because self-efficacy influences a person in acting to achieve a goal including in estimating what events they will face.

Besides self-efficacy, learning motivation is also one of the internal factors that influence student learning achievement. This is in line with Nashar's opinion (2004) which states that the learning motivation possessed by students in every learning activity plays a very important role in improving student learning achievement in certain subjects. If learning motivation appears every time they study, it is very likely that their learning achievement will increase. Students who are highly motivated in learning are likely to achieve high learning achievement, meaning that the higher their motivation, the more intense the effort and efforts made, the higher the learning achievement they will get.

Learning motivation is intended as a psychological condition that encourages students to carry out activities in order to achieve goals, namely maximum learning achievement. Thus, students who have the desire and motivation to succeed certainly tend to have a positive attitude, which can spur students to achieve better learning achievements (Rivai, & Murni, 2016). Not much different from that, according to Patarru, Nur'aini, and Palobo (2021) stated that mental support that encourages students in the learning process. Meanwhile, learning motivation according to Sappaile and Pristiwaluyo (2019) is achievement motivation that has a driving force from within students that encourages them to achieve the highest possible learning achievement based on certain standards of excellence. Several previous studies (Fane, & Sugito, 2019; Nurmuiza, Maonde, & Sani 2015; Patarru, Nur'aini, & Palobo, 2021; Sappaile, & Pristiwaluyo, 2019) found that learning motivation has a significant effect on student learning achievement.

Based on the description above, the researcher considers it necessary to conduct a study related to the variables that influence learning achievement originating from the students themselves. The researcher believes it is important to conduct research on the influence of mathematical disposition, self-efficacy, and learning motivation on the mathematics learning achievement of class X students of Madrasah Aliyah Arifah Gowa.

RESEARCH METHOD

This study employs a quantitative approach using an ex post facto research design to examine the relationship between independent and dependent variables. The research was conducted during the even semester of the 2024/2025 academic year at Madrasah Aliyah Arifah, Gowa Regency. This study utilizes a correlational design to determine the influence of three independent variables—mathematical disposition (X_1), self-efficacy (X_2), and learning motivation (X_3)—on a single dependent variable, mathematics learning achievement (Y). The population for this study comprised all tenth-grade students, with the sample selected through a random sampling technique.
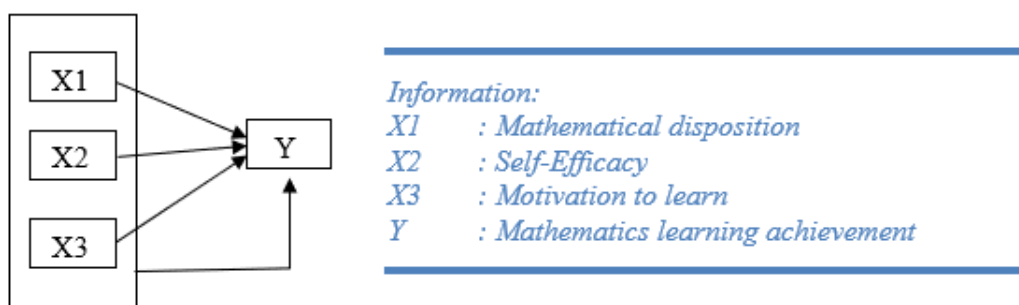

Figure 1. Research Design

To collect data, this research utilized two primary instruments: a test and assessment scales (questionnaires). The test instrument was used to measure the mathematics learning achievement variable, while questionnaires with a five-point Likert scale (from Strongly Agree to Strongly Disagree) were used to measure the variables of mathematical disposition, self-efficacy, and learning motivation. Prior to use, all instruments underwent an expert validation process to ensure content and construct validity, with the results indicating a "very valid" category based on an average score above 3.4. Furthermore, a reliability test using Cronbach's Alpha showed that all instruments had a value above 0.6, indicating that the instruments were reliable and consistent for data collection.

The data analysis technique applied in this study was multiple linear regression. This method was used to analyze and determine the extent of the combined influence of the independent variables (mathematical disposition, self-efficacy, and learning motivation) on the dependent variable (mathematics learning achievement). The regression equation model used to test the research hypothesis is as follows:

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3$$

where Y represents mathematics learning achievement, and X_1, X_2, and X_3 represent the aforementioned independent variables..

RESULT AND DISCUSSION

Results of descriptive statistical analysis

The following presents the results of descriptive statistical analysis obtained from the scores of each variable.

Table 1. Descriptive Statistics

Variables	Mean	Std. Deviation	N
Mathematical Disposition (X1)	77.197	5.5702	61
Self Efficacy (X2)	52.180	6.9246	61
Motivation to Learn Mathematics (X3)	55.393	5.4107	61
Mathematics Learning Achievement (Y)	11.869	3.1383	61

Mathematical disposition (X1)

The results of the descriptive analysis related to the scores of mathematical disposition variables by class X students of Madrasah Aliyah Arifah Gowa are presented inTable 7 below.

Table 2. Statistics of Mathematical Disposition Score

Statistics	Statistical Values
Mean (rate-rate)	70,59
Standard Deviation	13,248
Minimum	43,00
Maximum	115,00

Based on Table 2, it is obtained that the average score of students' mathematical disposition is 70.59, this shows that the average mathematical disposition of students is in the moderate category. The median is 70.50, this shows that most students get scores below 70.50 and most also get scores above 70.50 with a maximum score of 115.00 and a minimum score of 43.00. The standard deviation is 13.248, the variance is 175.518, this shows that the distribution of data is far from the average mathematical disposition of students which in this context shows that there are large differences in mathematical disposition among students and shows that the population or sample analyzed is not homogeneous but heterogeneous.

Table 3. Frequency Distribution and Percentage of Mathematical Disposition Scores

Interval Class	Frequency	Percentage (%)	Category
55 – 61	1	1,64	Very Low
62 – 68	2	3,27	Low
69 – 75	19	31,15	Currently
76 – 82	31	50,82	High
83 – 89	8	13,11	Very high

Based on table 3 above, it can be seen that the highest percentage is in the high category, thus it can be stated that the students' mathematical disposition is in the high category, namely 50.8%. This shows that the students' mathematical disposition is predominantly in the high category. The following data is presented in the form of a histogram.
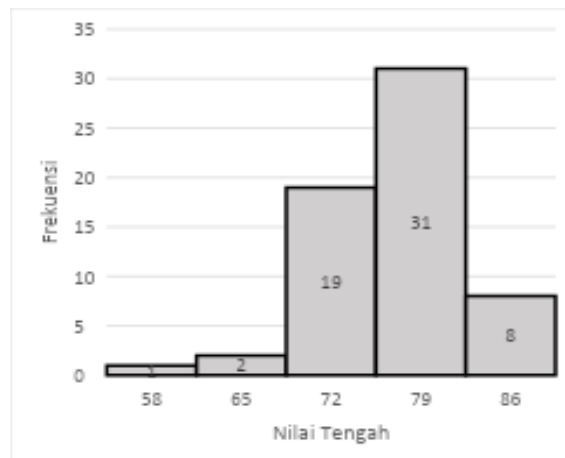
Figure 2. Histogram of Mathematical Disposition Distribution of Grade X Students of Arifah Gowa Islamic Senior High School

Self Efficacy (X2)

The results of the descriptive analysis related to the self-efficacy variable scores of class X students of Madrasah Aliyah Arifah Gowa are presented in Table 4 below.

Table 4. Self-Efficacy Score Statistics

Statistics	Statistical Values
Mean (rate-rate)	70,59
Standard Deviation	13,248
Minimum	43,00
Maximum	115,00

Based on Table 4, it is obtained that the average score of student self-efficacy is 70.59, this indicates that the average student self-efficacy is in the moderate category. The maximum value is 115.00 and the minimum value is 43.00. The standard deviation is 13.248, this indicates that the distribution of data is far from the average student self-efficacy which in this context indicates that there is a large difference in self-efficacy among students and indicates that the population or sample analyzed is not homogeneous but heterogeneous.

Table 5.Frequency Distribution and Percentage of Self-Efficacy Scores

Interval Class	Frequency	Percentage (%)	Category
34 – 40	3	4,9	Very Low
41 – 47	12	19,7	Low
48 – 54	25	41,0	Currently
55 – 61	16	26,2	High
62 – 68	5	8,2	Very high

Based on Table 5 above, it can be concluded that the self-efficacy of students in the high category is 26.2%, the medium category is 41.0%, and the low category is

19.7%, then for the very low category 4.9% and very high is 8.2%. This shows that the self-efficacy of students is predominantly in the medium category. The following data is presented in the form of a histogram.
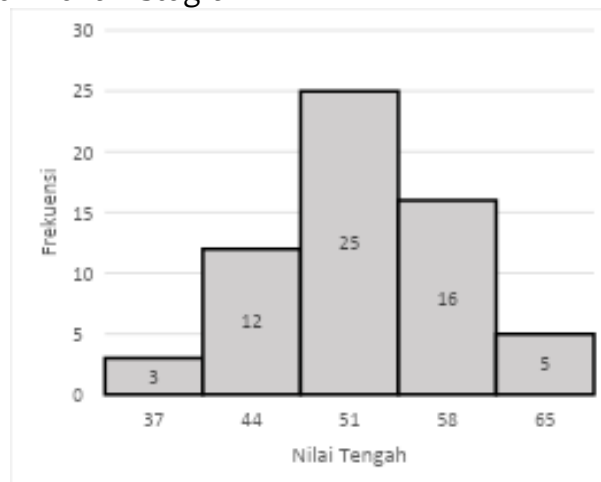

Figure 3. Histogram of Self-Efficacy Distribution of Grade X Students of Arifah Gowa Islamic Senior High School

Motivation to learn (X3)

The results of the descriptive analysis related to the learning motivation variable scores of class X students of Madrasah Aliyah Arifah Gowa are presented in Table 6 below.

Table 6. Study Motivation Score Statistics

Statistics	Statistical Values
Mean (rate-rate)	70,59
Standard Deviation	13,248
Minimum	43,00
Maximum	115,00

Based on Table 6, it is obtained that the average score of student learning motivation is 70.59, this shows that the average student learning motivation is in the moderate category. The maximum value is 115.00 and the minimum value is 43.00. The standard deviation is 13.248, this shows that the distribution of data is far from the average student learning motivation which in this context shows that there are large differences in learning motivation among students and shows that the population or sample analyzed is not homogeneous but heterogeneous.

Table 7.Frequency Distribution and Percentage of Learning Motivation Scores (x_3)

Interval Class	Frequency	Percentage (%)	Category
38 – 43	1	1,6	Very Low
44 – 49	7	11,5	Low
50 – 55	13	21,3	Currently
56 – 61	22	36,1	High
62 – 67	8	13,1	Very high

Based on Table 7 above, it can be concluded that student learning achievement in the high category is 24.5%, the medium category is 34.1%, and the low category is 27.4%, then for 36.1 the very low category is 13.1% and very high is 1.6%. This shows that student learning achievement is predominantly in the high category. The following data is presented in the form of a histogram.
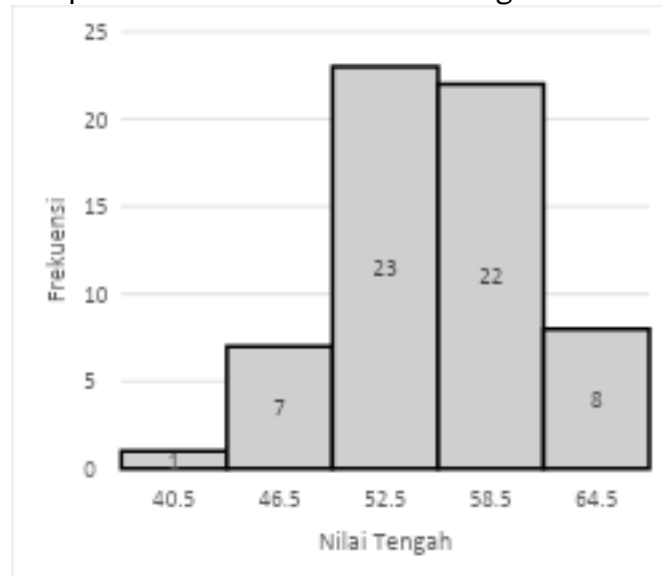

Figure 4. Histogram of Distribution of Learning Motivation of Class X Students of Arifah Gowa Islamic Senior High School

Learning Achievement (Y)

The results of the descriptive analysis related to the scores of learning achievement variables by class X students of Madrasah Aliyah Arifah Gowa are presented in Table 8 below.

Table 8. Statistics of Learning Achievement Scores

Statistics	Statistical Values
Mean (rate-rate)	11,87
Standard Deviation	3,14
Minimum	5,00
Maximum	17,00

Based on Table 8, it is obtained that the average score of student learning achievement is 11.87, this shows that the average student learning achievement is in the moderate category. The maximum value is 17.00 and the minimum is 5.00. The standard deviation is 3.14, this shows that the distribution of data is far from the average student learning achievement which in this context shows that there is a large difference in learning achievement among students and shows that the population or sample analyzed is not homogeneous but heterogeneous.

Table 9. Frequency Distribution and Percentage of Learning Achievement Scores

Interval Class	Frequency	Percentage (%)	Category
4 – 6	3	4,9	Very Low

7 – 9	12	19,7	Low
10 – 12	19	31,1	Currently
13 – 15	18	29,5	High
16 – 18	9	14,8	Very high

Based on Table 9 above, it can be concluded that the learning achievement of students in the high category is29,5%, medium category of31,1%, and low by19,7%, then for the very low category 4,9% and very high is 141,8%. This shows that students' learning achievement is predominantly in the moderate category. The following data is presented in the form of a histogram.
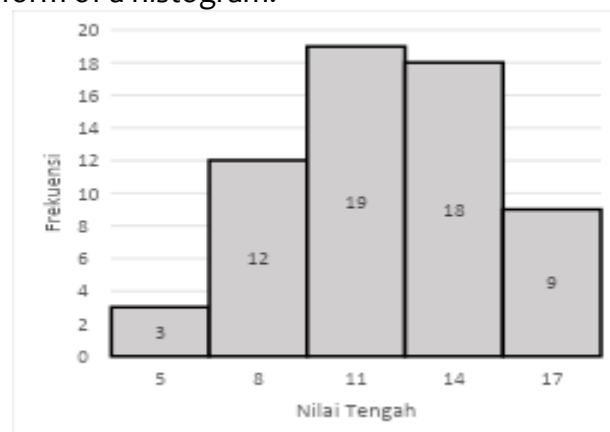

Figure 5. Histogram of Distribution of Learning Motivation of Class X Students of Arifah Gowa Islamic Senior High School

Results of inferential statistical analysis

Mathematical disposition, self-efficacy, and learning motivation are jointly related to the mathematics learning achievement of students at Madrasah Aliayah Arifah, Gowa Regency.

Statistical hypotheses tested:

$H_0: \beta_1 = \beta_2 = \beta_3 = 0$

$H_1: b_i \neq 0$ for i, i = 1, 2, 3.

Table 10.Variance Analysis

Model		Sum of Squares	Df	Mean Square	F	Say.
1	Regression	291.645	3	97.215	18.514	.000[b]
	Residual	299.306	57	5.251		
	Total	590.951	60			

a. Predictors: (Constant), X3, X2, X1
b. Dependent Variable: Y

Table 11. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.703[a]	.494	.467	2.2915

a. Predictors: (Constant), X3, X1, X2

Based on Table 10, the F value$_{count}$= 18.514 with p-value = 0.0001 <α = 0.05 then it can be stated that Ho is rejected. This shows that the independent variables X1, X2 and X3 together have a relationship with the dependent variable Y. Furthermore, based on Table 11, R^2 = 0.49 or R^2= 49%. This shows that the magnitude of the relationship between mathematical disposition, self-efficacy and learning motivation together has a relationship with mathematics learning achievement in Gowa Regency equal to 49%.

Table 12.Coefficient

Model		Unstandardized Coefficients		Standardized Coefficients	t	Say.
		B	Std. Error	Beta		
1	(Constant)	-8.766	4.769		-1.838	.071
	X1	-.010	.055	-.017	-.175	.862
	X2	.178	.060	.394	2.958	.005
	X3	.218	.075	.376	2.897	.005

Information:

X1: Mathematical disposition, X2: Self-efficacy, X3: Learning motivation

Based on Table 12, for variable X1 the t value$_{count}$= -1.84 then it can be stated that Ho is accepted. This means that the independent variable X1 does not have a positive relationship with the dependent variable Y. Furthermore, for variable X2 the t value$_{count}$= 2.96 with a p-value = 0.005 < α = 0.05, it can be stated that Ho is rejected. This means that the independent variable X2 has a positive relationship with the dependent variable Y. Furthermore, for variable X3 the t-value$_{count}$= 2.90 with p-value = 0.005 < α = 0.05 then it can be stated that Ho is rejected. This means that the independent variable X3 has a positive relationship with the dependent variable Y.Miske (2024) stated that, theoretically, students' mathematics learning achievement is influenced by many factors, some of which are self-efficacy, mathematical disposition, and parental involvement. According to Collin (1982) explained that students with good self-efficacy and high accuracy in mathematical calculations show greater persistence in mathematics lessons compared to students with lower self-efficacy. This persistence also has a major impact on students' learning achievement. Several previous studies have also demonstrated the importance of self-efficacy and its impact in predicting students' mathematics learning performance and achievement. One study that also supports this is according to Parker et al. (2014) which states that important things that have a direct influence on students' mathematics learning achievement are*mathematics self efficacy* where students have confidence in doing math tasks. Another thing that also affects students' math achievement is mathematical disposition. According to Kurniawan and Kadarisma (2020), mathematical disposition has a positive effect on mathematical problem-solving ability by 55.6%. This indicates that the higher the student's mathematical disposition, the higher the student's mathematical problem-solving ability. Mathematical problem-solving ability is closely related to mathematics learning

achievement. This has been proven by several previous studies (Maulani, Amalia, & Zanthy, 2020; Bayareal, & Tan, 2023, Sinaga, Sitorus, & Situmeang, 2023). The relationship and relationship between mathematical disposition and learning achievement is also proven by Lin and ChunTai's research (2016) which states that there is a positive relationship between mathematical disposition and students' mathematics learning achievement. Students who have a positive mathematical disposition will have the will to be actively involved in learning mathematics, which then causes their mathematics achievement to be better. Mathematics learning achievement is not only influenced by internal factors but also by external factors.Based on Schunk and Nagy (2009) stated that the abstract and systematic characteristics of mathematics make students have difficulty and easily get bored. Therefore, when learning mathematics, self-efficacy greatly influences mastery and achievement. because students with high self-efficacy tend to have more regularity (goal setting, use of active learning strategies, monitoring their understanding, evaluating progress) and creating an effective environment for learning (eliminating or minimizing distractions, finding effective learning partners). Even Castejon et al. (2006) stated that self-efficacy that motivates students to learn can make students demand themselves for completion so that it affects the achievement of high learning achievement.

CONCLUSION

Based on the research results, the following conclusions are drawn. Statistically descriptive: (1) students' mathematical disposition is in the high category, (2) students' self-efficacy is in the medium category, (3) students' learning motivation is in the medium category, and (4) students' mathematics learning achievement is in the medium category. Statistically inferential: (1) mathematical disposition, self-efficacy, and learning motivation together have a relationship with mathematics learning achievement; (2) Mathematical disposition does not have a positive relationship with mathematics learning achievement, after taking into account self-efficacy and learning motivation; (3) self-efficacy has a positive relationship with mathematics learning achievement, after taking into account mathematical disposition and learning motivation, and (4) learning motivation has a positive relationship with mathematics learning achievement, after taking into account self-efficacy and mathematical disposition.

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