THE INFLUENCE OF NUMERICAL INTELLIGENCE AND HABITS OF MIND ON STUDENTS' MATHEMATICAL REASONING ABILITY

Mesi Audina Gifael[1*], Aniswita[2], Isnaniah[3], Rusdi[4]

[1,2,3,4]*Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi*
E-mail : mesigifael290503@gmail.com

ABSTRACT

This research was conducted at SMPN 1 Bukittinggi with a focus on examining the roles of numerical intelligence and habits of mind in students' mathematical reasoning ability. The study aimed to investigate: (1) the significant influence of numerical intelligence on mathematical reasoning ability, (2) the significant influence of habits of mind on mathematical reasoning ability, and (3) the significant influence between numerical intelligence and habits of mind on mathematical reasoning ability simultaneously. This research was a quantitative research with a correlational approach. The sample of this research are 54 students at 9th grade at SMPN 1 Bukittinggi and used simple random sampling techniques. Data were collected by tests and questionnaire, which are habits of mind questionnaire, numerical intelligence test, and mathematical reasoning ability test. Data was analyzed using simple linear regression and multiple linear regression. The results showed a significant influence of numerical intelligence on mathematical reasoning ability with a significance value of 0,000<0,05, a significant influence of habits of mind on mathematical reasoning ability with a significance value of 0,000<0,05, and a simutaneos significant of numerical intelligence and habits of mind on mathematical reasoning ability with a significance value of 0,000<0,05. The implications of this study are the importance of increasing students' numerical intelligence and habits of mind as a key factors in improving mathematical reasoning ability.

Keywords : *Numerical Intelligence, Habits Of Mind, Mathematical Reasoning Ability, Influence*

ABSTRAK

Penelian ini dilaksanakan di SMP Negeri 1 Bukittinggi dengan fokus penelitian terkait kecerdasan numerik dan kebiasaan berpikir dalam kemampuan penalaran matematis siswa. Tujuan penelitian ini untuk mengetahui: (1) ada atau tidaknya pengaruh signifikan kecerdasan numerik terhadap kemampuan penalaran matematis, (2) ada atau tidaknya pengaruh signifikan kebiasaan berpikir terhadap kemampuan penalaran matematis, dan (3) ada atau tidaknya pengaruh simultan yang signifikan antara kecerdasan numerik dan kebiasaan berpikir matematis terhadap kemampuan penalaran matematis. Penelitian ini merupakan penelitian kuantitatif dengan pendekatan korelasional. Sampel penelitian ini berjumlah 54 siswa yang dipilih dengan menggunakan teknik sampel acak sederhana. Data penelitian dikumpulkan melalui tes dan kuesioner, meliputi kuesioner kebiasaan berpikir matematis, tes kecerdasan numerik, dan tes kemampuan penalaran matematis. Pengolahan data penelitian dilakukan dengan analisis regresi linier sederhana dan analisis regresi linier berganda. Hasil penelitian menunjukkan bahwa terdapat pengaruh signifikan kecerdasan numerik terhadap kemampuan penalaran matematis dengan nilai signifikansi 0,000<0,05, terdapat pengaruh signifikan kebiasaan berpikir terhadap kemampuan penalaran matematis dengan nilai signifikansi 0,000<0,05, dan terdapat pengaruh signifikan secara simultan antara kecerdasan numerik dan kebiasaan berpikir terhadap kemampuan penalaran matematis dengan nilai signifikansi 0,000<0,05. Implikasi penelitian ini menunjukkan bahwa pentingnya meningkatkan kecerdasan numerik dan kebiasaan berpikir siswa untuk meningkatkan kemampuan penalaran matematis siswa.

Kata Kunci : *Kecerdasan Numerik, Kebiasaan Berpikir, Kemampuan Penalaran Matematis, Pengaruh*

INTRODUCTION

Reasoning constitutes an advanced dimension of the thinking process. Reasoning skills are essential for students in the learning process within the Merdeka Curriculum as currently implemented curriculum in Indonesia. This emphasis is explicitly reflected in one of the Pancasila Student Profiles, namely critical reasoning (Kemendikbudristek RI, 2022). In the context of education, one domain that is closely associated with thinking and reasoning processes is mathematics learning. Mathematical reasoning ability is one of the standards established by the NCTM (*National Council of Teachers of Mathematics*), alongside other mathematical abilities, namely mathematical problem-solving ability, mathematical communication ability, mathematical connection ability, and mathematical representation ability (David A Reid, 2022). NCTM also emphasizes that mathematical reasoning is a key element in developing strong conceptual understanding as well as effective mathematical problem-solving skills (Putri et al., 2023).

Mathematical reasoning skills encompass inductive reasoning, deductive reasoning, and proportional reasoning. Through mathematical reasoning skills, students are better supported in structuring their reasoning when solving problems, making generalizations, and proving statements (Agustiana Putri et al., 2025). Therefore, it is essential for students to develop well-established mathematical reasoning skills. However, in reality, TIMSS data from 2023 indicate that the reasoning domain obtained the lowest score compared to the other two assessed domains, namely knowing and applying. The mathematical reasoning indicators used in TIMSS 2023 include analysis, integration, generalization, and justification (Mullis et al., 2021).

Based on an analysis of the documentation of daily assessment answer sheets from Grade IX A to IX C for the 2024/2025 school year, the researcher found that the majority of students tended to have low mathematical reasoning ability. In this context, students are classified as having low reasoning ability if their mathematical reasoning score is below 60. It was identified that 73.86% of the students fell into the category of low mathematical reasoning ability. This finding is supported by the percentage data of students' daily assessment scores, in which two out of the five test items included indicators of mathematical reasoning.

The data indicate that students' mathematical reasoning ability needs to be improved. Contributing factors include low numerical intelligence, weak habits of mind, insufficient mastery of prerequisite material, and a lack of seriousness in students' engagement with the learning process. Therefore, it is important for teachers to give due attention to students from both cognitive and non-cognitive perspectives. Cognitive ability refers to an individual's capacity to acquire, process, and apply knowledge through mental activities such as thinking, reasoning, problem solving, and remembering (Febrianti et al., 2023). According to Bloom, cognitive ability is a domain of learning that involves intellectual skills arranged hierarchically, including remembering, understanding, applying, analyzing, evaluating, and creating (Juanti et al., 2024). In order to develop mathematical reasoning ability that requires higher-order thinking skills (HOTS), students must first possess foundational abilities, such as basic computation, pattern recognition, and the ability to solve simple problems (Pickering et al., 2025). This ability is also referred to as numeracy skills or numerical intelligence.

Numerical intelligence, as a component of logical–mathematical intelligence, plays an important role in fostering students' mathematical abilities (Vira & Aniswita, 2022). Campbell stated that students can be considered to have strong numerical intelligence when they demonstrate mastery of mathematical computations, the ability to solve number-related problems, and

sensitivity to numerical patterns (Mintarsih & Prasetyono, 2025). Students who are accustomed to and enjoy working with numbers tend to practice more frequently, which in turn sharpens their reasoning ability. This also enables students with high numerical intelligence to solve mathematical reasoning problems more easily (Alfaradea & Danuri, 2023). Research conducted by (Rahma et al., 2025), entitled *"The Influence of Numerical Ability and Learning Concentration on Mathematical Reasoning Ability of Grade VIII Students at SMP Negeri 2 Majene,"* indicates that there is a significant effect of numerical ability on the mathematical reasoning ability of Grade VIII students at SMP Negeri 2 Majene. Therefore, it is hypothesized that numerical intelligence is a factor that influences students' mathematical reasoning ability.

In addition to cognitive aspects, non-cognitive aspects are also important considerations in mathematical reasoning (Aniswita, Sepriyanti, et al., 2024). Students' perseverance in dealing with unfamiliar mathematical problems, their ability to work carefully and accurately, their willingness to question and pose problems, their metacognitive awareness, and their capacity to apply prior knowledge to new situations are attitudes required for successfully solving mathematical reasoning problems (Fatra et al., 2022). These attitudes are referred to as mathematical habits of mind, with indicators proposed by (Costa & Kallick, 2009), including persisting, asking and posing problems, thinking about thinking (metacognition), applying past knowledge to new situations, and striving for accuracy.

Mathematical habits of mind that are developed through repeated practice in the learning experiences of students serve as a foundation for studying mathematical material that requires more complex abilities, such as mathematical reasoning skills (Indriani & Retnawati, 2025). Thus, mathematical habits of mind constitute one of the fundamental bases for students to develop strong mathematical reasoning ability. In addition, study was conducted by (Aprilia, 2022) entitled *"The Influence of Habits of Mind on Mathematical Reasoning Ability through Students' Prior Knowledge at the Junior High School Level,"* it was found that thinking habits have a significant positive effect on mathematical reasoning ability, with a contribution of 57.9%.

In the theory of multiple intelligences, Gardner also states that numerical intelligence can assist students in solving higher-level mathematical problems, including those related to mathematical reasoning ability (Suseno et al., 2023). High numerical intelligence, accompanied by curiosity, perseverance, and a high level of accuracy, enhances students' success in understanding mathematical problems with greater levels of difficulty. Nevertheless, based on field data, there are students who exhibit weak habits of mind yet achieve relatively good mathematical reasoning scores, as well as students who demonstrate strong numerical intelligence but obtain low mathematical reasoning scores. This phenomenon has motivated the researcher to conduct further investigation entitled *"The Influence of Numerical Intelligence and Habits of Mind on the Mathematical Reasoning Ability of Grade IX Students at SMP Negeri 1 Bukittinggi."* The purpose of this study is to determine whether there is a significant influence of numerical intelligence and thinking habits on mathematical reasoning ability, both partially and simultaneously.

METHOD

This study is a quantitative research that refers to the context of justification. It examines theories related to the research problem through a paradigm formulated in the form of research hypotheses. The method employed in this study is the survey method (Farhani & Noor, 2024).

This quantitative survey research aims to collect and analyze quantitative data, as well as other types of data that can be counted, measured, and processed using statistical techniques.

This quantitative study was conducted using a correlational approach. Correlational research aims to examine the relationship between two or more variables. The present study focuses on statistical analysis involving three variables, namely variable X_1, variable X_2, and variable Y. Furthermore, this study investigates whether there is a contribution of numerical intelligence (X_1) and habits of mind (X_2) to students' mathematical reasoning ability (Y) in Grade IX at SMP Negeri 1 Bukittinggi, both individually and simultaneously. The research design is presented as follows:

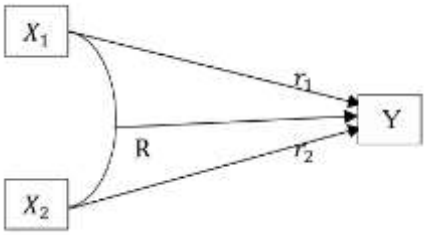


Figure 1. Research Design

The population of this study consisted of all Grade IX students at SMP Negeri 1 Bukittinggi in the 2024/2025 academic year, totaling 239 students. In terms of sample selection, this study employs probability sampling. Probability sampling is a technique that provides equal opportunity for each member of the population to be selected as a sample (Wahyuning, 2021). Specifically, simple random sampling is used as the sampling technique. Prior to sample selection using the simple random sampling technique, normality and homogeneity tests were conducted as prerequisites for this sampling method. After the population was confirmed to be normally distributed and homogeneous, 54 students were selected as the research sample.

Data were collected through questionnaires and tests. Students' numerical intelligence (X_1) was measured using an objective test that had passed validity, reliability, item difficulty, discrimination index, and distractor effectiveness analyses (Arikunto, 2007). Students' habits of mind (X_2) was measured using a questionnaire that had passed validity and reliability tests. Meanwhile, students' mathematical reasoning ability (Y) was measured using a subjective test that had passed validity, reliability, item difficulty, and discrimination index analyses.

Data analysis was conducted using simple linear regression and multiple linear regression analyses with the assistance of SPSS version 21. Prior to performing regression analysis, classical assumptions test were carried out, including tests of normality, linearity, multicollinearity, heteroscedasticity, and autocorrelation (Zurahmah & Isnaniah, 2023). After the data met all classical assumptions test, simple linear regression analysis was applied to examine whether numerical intelligence had a significant effect on mathematical reasoning ability and whether habits of mind had a significant effect on mathematical reasoning ability . Subsequently, multiple linear regression analysis was conducted to determine whether numerical intelligence and habits of mind simultaneously had a significant effect on mathematical reasoning ability.

RESULTS AND DISCUSSION

The study was conducted by administering a numerical intelligence test, a habits of mind questionnaire, and a mathematical reasoning ability test to 54 Grade IX students at SMP Negeri 1

Bukittinggi. The results indicate that students' numerical intelligence scores ranged from $40 < X \leq 100$, suggesting that their numerical intelligence levels varied from low to high. Furthermore, habits of mind scores fell within the range of $110 < X \leq 162$, indicating moderate to high levels of habits of mind. Meanwhile, students' mathematical reasoning ability scores ranged from $25 < X \leq 87.5$, which reflects low to high levels of mathematical reasoning ability.

Classical Assumptions Test

The normality test is used to determine whether the residual values are normally distributed. A good regression model is characterized by normally distributed residuals. Therefore, the normality test is not conducted on each variable individually but on the residual values *(*Rodliyah, 2021*)*.

Table 1. The Result of Normality Test

Normality Test	Unstandardized Residual
N	54
Test Statistic	0.108
Asymp. Sig. (2-tailed)	0.172

The significance value of the residual normality test is indicated by the Asymp. Sig. (2-tailed) value of $0.172 > 0.05$. Therefore, the residuals are normally distributed, and the normality assumption is satisfied.

Next, a linearity test was conducted to determine whether the relationship between the two variables under study was linear. The relationship between variables is considered linear if the significance value of the linearity test is greater than 0.05. Conversely, if the significance value is less than 0.05, the relationship is non-linear. The results of the linearity test are presented as follows:

Table 2. The Result of Linearity Test

	Sig.	Interpretation
X_1 and Y	0,497	Linear
X_2 and Y	0,795	Linear

The multicollinearity test is used to examine whether there is a significant correlation among the independent variables. The criteria applied are that if the VIF value is less than 10 or the tolerance value is greater than 0.1, the regression model is considered free from multicollinearity problems. The results of the multicollinearity test are presented as follows:

Table 3. The Result of Multicollinearity Test

Variable	Test	
	Tolerance	VIF
Numerical Intelligence Habits of Mind	0.286	3.500
Dependent Variable : Mathematical Reasoning Ability		

Based on the SPSS calculations, the variables of numerical intelligence and habits of mind indicate no multicollinearity. As the tolerance values for both variables are $0.286 > 0.1$, and the VIF values for both variables are $3.500 < 10$.

The heteroscedasticity test is used to determine whether there is inequality in the variance of the residuals in the regression observations. If a specific pattern appears, such as points forming

a regular pattern (e.g., wavelike, widening and then narrowing), heteroscedasticity is present. Conversely, if no clear pattern is observed and the points are scattered above and below zero on the Y-axis, heteroscedasticity does not occur. The results of the heteroscedasticity test using SPSS are shown in the following figure.

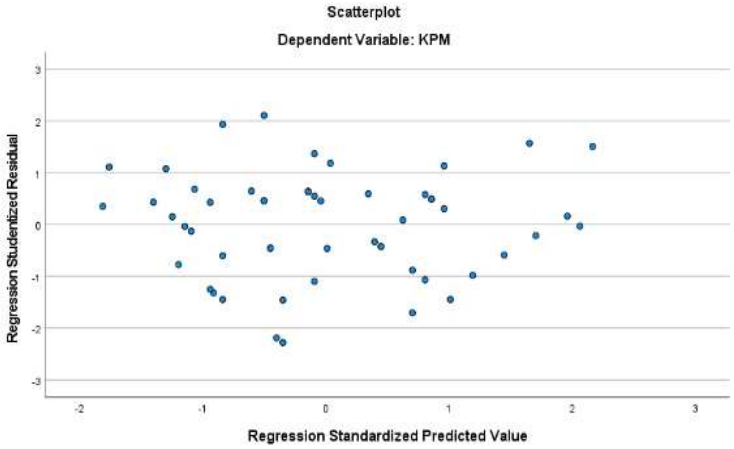


Figure 2. The Result of Heteroscedasticity Test

Based on Figure 2, no distinct or systematic pattern is observed, and the data points are scattered above and below zero on the Y-axis. Therefore, there is no indication of heteroscedasticity.

The autocorrelation test is used to determine whether the residuals from one observation are correlated with those from other observations in the model. In this study, the autocorrelation test was conducted using the Durbin–Watson method. The criterion for the test is that if $d_u < DW < 4 - d_u$, the model is considered free from autocorrelation. The results of the autocorrelation test are presented as follows:

Table 4. Result of Autocorrelation Test

Independent Variable	Dependent Variable	Durbin-Watson
Numerical Intelligence Habits of Mind	Mathematical Resoning Ability	2.219

Based on the SPSS calculations, the Durbin–Watson (dW) value obtained was 2.219, while the upper critical value (d_u) was 1.6800. Thus, the following condition is satisfied:

$$1.6800 < 2.219 < 4 - 1.6800$$
$$1.6800 < 2.219 < 2.3200$$

Therefore, according to the Durbin–Watson criteria, there is no autocorrelation in the research data.

Hypothesis Test

Hypothesis testing in this study was conducted using simple linear regression and multiple linear regression analyses. Simple linear regression analysis was used to determine whether there was a significant effect of numerical intelligence (X_1) on students' mathematical reasoning ability (Y) and whether there was a significant effect of habits of mind (X_2) on students' mathematical reasoning ability (Y). Meanwhile, multiple linear regression analysis was employed to examine whether numerical intelligence (X_1) and habits of mind (X_2) simultaneously had a significant effect on students' mathematical reasoning ability (Y).

Simple Linear Regression

Simple linear regression analysis can be conducted after the classical assumption tests have been satisfied. Hypothesis testing utilizes the Product Moment correlation coefficient, which is then used to calculate the t-value. Hypothesis testing was performed with the assistance of SPSS. The simple correlation values between numerical intelligence and mathematical reasoning ability, as well as between habits of mind and students' mathematical reasoning ability, can be seen in the following SPSS table:

Table 5. Result of Pearson Correlation between X_1 and Y

		Numerical Intelligence	Mathematical Reasoning Ability
Numerical Intelligence	Pearson Correlation	1	.826**
	Sig. (2-tailed)		.000
	N	54	54
Mathematical Reasoning Ability	Pearson Correlation	.826**	1
	Sig. (2-tailed)	.000	
	N	54	54

Table 6. Result of Pearson Correlation between X_2 and Y

		Habits of Mind	Mathematical Reasoning Ability
Habits of Mind	Pearson Correlation	1	.851**
	Sig. (2-tailed)		.000
	N	54	54
Mathematical Reasoning Ability	Pearson Correlation	.851**	1
	Sig. (2-tailed)	.000	
	N	54	54

Based on the calculation of the correlation coefficients, the correlation between numerical intelligence and mathematical reasoning ability was 0.826, indicating a strong positive relationship. Furthermore, the correlation coefficient between habits of mind and mathematical reasoning ability was 0.851, which falls into the high category positive relation.

Subsequently, a significance test, also known as the regression significance test, was conducted. The significance test of simple linear regression in this study was carried out to determine whether there was a significant effect of numerical intelligence on mathematical reasoning ability and whether there was a significant effect of habits of mind on mathematical reasoning ability. The results of the significance test using SPSS are presented in the following table.

Table 7. Result of Significance Test between X_1 and Y

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9325.417	1	9325.417	136.876	.000[b]

	Residual	3542.783	52	68.130		
	Total	12868.200	53			
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	4.007	4.247		.944	.350
	Numerical Intellilgence	.657	.062	.826	10.584	.000

Table 8. Result of Significance Test between X_2 and Y

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9325.417	1	9325.417	136.876	.000b
	Residual	3542.783	52	68.130		
	Total	12868.200	53			
		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-102.279	12.818		-7.979	.000
	Habits of Mind	1.111	.095	.851	11.699	.000

If t-value > t-table, the simple linear regression is considered significant. Conversely, if t-value < t-table, the simple linear regression is not significant (Saputri et al., 2025). In this study, based on table 7, the t-value was 10.584, while the value of t-table was 1.674, indicating that t-value > t-table (10.584 > 1.674). Therefore, the linear regression of numerical intelligence on mathematical reasoning ability is significant, which means that numerical intelligence has a significant positive effect on mathematical reasoning ability. Meanwhile, based on table 8, The t-value was 11.69, while the value of t-table was 1.674, indicating that t-value > t-table (11.69 > 1.674). Therefore, the linear regression of habits of mind on mathematical reasoning ability is significant, which means that habits of mind have a significant positive effect on mathematical reasoning ability.

In addition, the coefficient of determination was calculated to indicate the magnitude of the contribution of numerical intelligence (X_1) and habits of mind (X_2), individually, to mathematical reasoning ability (Y). The formula for the coefficient of determination in simple linear regression is as follows:

$$D = r^2 \text{ x } 100\%$$

Based on the results of the coefficient of determination analysis, the contribution of numerical intelligence to mathematical reasoning ability was 68.3%, resulting in the simple linear regression equation $\hat{Y} = 4.01 + 0.66X_1$. Meanwhile, the contribution of habits of mind to mathematical reasoning ability was 72.5%, yielding the regression equation $\hat{Y} = -102.279 + 1.111X_2$.

Multiple Linear Regression

Multiple linear regression analysis was employed to examine whether numerical intelligence (X_1) and habits of mind (X_2) simultaneously had a significant effect on students' mathematical reasoning ability (Y). The multiple correlation values between numerical

intelligence, habits of mind and mathematical reasoning ability, can be seen in the following SPSS table:

Table 9. Result of Multiple Pearson Correlation

		Mathematical Reasoning Ability
Numerical Intelligence * Habits of Mind	Pearson Correlation	.874**
	Sig. (2-tailed)	.000
	N	54

Based on the calculation of the correlation coefficients, the correlation between numerical intelligence, habits of mind, and mathematical reasoning ability was 0.874, indicating a strong positive relationship. The significance of the multiple regression, which indicates whether numerical intelligence and habits of mind simultaneously have a significant effect on mathematical reasoning ability, was tested using the F-test. The results of the F-test calculation using SPSS are presented as follows:

Table 10. Result of F-Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9840.780	2	4920.390	82.889	.000[b]
	Residual	3027.420	51	59.361		
	Total	12868.200	53			

The basis for decision making is that if the F-value > F-table at the 5% significance level, and if the significance value (sig.) is less than 0.05, then the multiple linear regression is considered significant. Based on Table 10, the results show that F-value > F-table (82.998 > 3.183), and the significance value is 0.000 < 0.05. Therefore, the multiple linear regression is significant, indicating that numerical intelligence and habits of mind simultaneously have a significant positive effect on mathematical reasoning ability.

In addition, the coefficient of determination was calculated to indicate the magnitude of the contribution of numerical intelligence (X_1) and habits of mind (X_2), to mathematical reasoning ability (Y) simultaneously. The formula for the coefficient of determination in simple linear regression is as follows:

$$KP = R^2 \text{ x } 100\%$$

Based on the results of the coefficient of determination analysis, the contribution of numerical intelligence and habits of mind to mathematical reasoning ability was 76.5%. Thus, resulting in the multiple linear regression equation $\hat{Y} = -66{,}28 + 0{,}298X_1 + 0{,}698X_2$.

Discussion

The Influence of Numerical Intelligence on Students' Mathematical Reasoning Ability

Based on the results of the simple linear regression analysis, the regression equation for numerical intelligence on mathematical reasoning ability is $\hat{Y} = 4.01 + 0.66X_1$, with a coefficient of determination of 68.5%. The value of t-value > t-table (10.584 > 1.674) with a significance level

of 0.000 < 0.05 indicates that numerical intelligence has a significant positive effect on mathematical reasoning ability.

Students' numerical intelligence serves as a foundation for developing higher-level mathematical abilities. Numerical intelligence, which comprises mathematical computation, sensitivity to numerical patterns and relationships, and number-related problem solving, represents fundamental indicators that enable students to develop strong analytical, justification, integration, and generalization skills. These abilities of analysis, justification, integration, and generalization are key indicators of mathematical reasoning ability (Putri et al., 2023). Research conducted by (Rahma et al., 2025) indicates that there is a significant effect of numerical ability on the mathematical reasoning ability of Grade VIII students at SMP Negeri 2 Majene. In Addition, A study conducted by (Miranti, 2020) showed that the influence of numerical intelligence on the mathematical reasoning ability of Grade VIII students at SMP Negeri 3 Bobotsari was 18.2%. Study was conducted by (Aniswita, Fauzan, et al., 2024) students with high mathematical ability are able to carry out the discovery and evaluation of concepts effectively through to the end. Thus, the results of the theoretical analysis and relevant previous studies are consistent with and support the findings of this study.

The Influence of Habits of Mind on Students' Mathematical Reasoning Ability

Based on the results of the simple linear regression analysis, the regression equation obtained is $\hat{Y} = -102.279 + 1.111X_2$, with the coefficient of determination indicating that habits of mind contribute 72.5% to mathematical reasoning ability. The value of t-value > t-table and a significance level of 0.000 < 0.05 indicated that habits of mind has a significant positive effect on mathematical reasoning ability.

Habits of mind are closely related to higher-order mathematical abilities, one of which is mathematical reasoning ability. Well-developed habits of mind, such as metacognitive thinking, strongly support the development of mathematical reasoning (Fatra et al., 2022). This is because, in mathematics learning, students are expected to analyze problems in depth, identify patterns, and establish logical relationships among various concepts. Relevant research conducted by (Aprilia, 2022) showed a total effect of 57.9%. Based on the analysis of existing theories and relevant studies, these findings are consistent with and support the results of the present study.

The Influence of Numerical Intelligence and Habits of Mind on Students' Mathematical Reasoning Ability

Based on the results of statistical data analysis, the multiple linear regression equation for numerical intelligence and habits of mind simultaneously is $\hat{Y} = -66.28 + 0.298X_1 + 0.698X_2$. Furthermore, the coefficient of determination indicates that numerical intelligence and habits of mind jointly contribute 76.5% to mathematical reasoning ability, while the remaining 23.5% is influenced by other variables not examined in this study. With F-value > F-table (82.998 > 3.183) and a significance value of 0.000 < 0.05, it can be concluded that numerical intelligence and habits of mind simultaneously have a significant positive effect on mathematical reasoning ability.

According to Gardner, mathematical reasoning ability is supported simultaneously by cognitive and non-cognitive aspects. Strong mathematical computation skills foster students' habits of working with high levels of accuracy and precision. Furthermore, well-developed sensitivity to numerical patterns and strong number-related problem-solving abilities enable students to apply prior knowledge to new situations and to carefully evaluate the solutions they obtain (Suseno et al., 2023). Based on the analysis of existing theories, these findings are consistent with and support the results of the present study.

CONCLUSION

Based on the results of the study conducted at SMP Negeri 1 Bukittinggi, it can be concluded that numerical intelligence has a significant positive effect on mathematical reasoning ability, habits of mind have a significant positive effect on mathematical reasoning ability, and numerical intelligence and habits of mind simultaneously have a significant positive effect on the mathematical reasoning ability of Grade IX students at SMP Negeri 1 Bukittinggi. These findings indicate that the better students' numerical intelligence and habits of mind are, the better their mathematical reasoning ability will be, and vice versa. Therefore, numerical intelligence and habits of mind are important factors that should be considered in efforts to improve students' mathematical reasoning ability. Teachers are expected to innovate in designing engaging learning strategies to enhance students' reasoning skills. In addition, teachers should first identify students' numerical intelligence as a foundational ability for solving advanced mathematical reasoning problems and address issues related to students' numerical skills. Moreover, teachers are encouraged to provide motivation at the beginning of lessons to foster students' enthusiasm for learning mathematics, which in turn can support the development of stronger habits of mind.

REFERENCES

Agustiana Putri, D. A., Sugiman, S., & Purnomo, Y. W. (2025). Analysis of Thinking Mathematics Based on Van de Walle's: A Case Study in Students Grade 5th: Analysis of Thinking Mathematics Based on Van de Walle's. *Primary Education Insight*, *1*(2), 67–79. https://doi.org/10.65779/pedi.v1i2.34

Alfaradea, R. S., & Danuri. (2023). Literasi Matematika Ditinjau Dari Penalaran Matematis Pada Anak Berkebutuhan Khusus Di SD Negeri Siyono I. *Elementary School*, *10*(1), 1–10.

Aniswita, A., Sepriyanti, N., & Medika, G. H. (2024). Unravelling undergraduate mathematics students' understanding of derivatives. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, 262–272. https://doi.org/10.23917/jramathedu.v9i4.11267

Aniswita, Fauzan, A., & Armiati. (2024). How Students Understand the Area under a Curve: A Hypothetical Learning Trajectory. *Mathematics Teaching Research Journal*, *16*(3), 80–101.

Aprilia, B. (2022). *Pengaruh Kebiasaan Berpikir Terhadap Kemampuan Penalaran Matematis Melalui Kemampuan Awal Siswa SMP* [Bachelor Thesis, FTIK UIN Syarif Hidayatullah Jakarta]. https://repository.uinjkt.ac.id/dspace/handle/123456789/59350

Arikunto, S. (2007). *Dasar—Dasar Evaluasi Pendidikan*. Bumi Aksara.

Costa, A. L., & Kallick, B. (2009). *Habits of Mind Across the Curriculum: Practical and Creative Strategies for Teacher*. ASCD.

David A Reid. (2022). Reasoning'in national curricula and standards. *Twelfth Congress of the European Society for Research in Mathematics Education (CERME12)*, *28*, 1–9.

Farhani, M. A. I., & Noor, N. L. (2024). The Effect of Learning Independence and Gender on Students' Mathematics Learning Achievement. *Jurnal Pendidikan Matematika (Kudus)*, *7*(2), 265–280. https://doi.org/10.21043/jpmk.v7i2.28026

Fatra, M., Sihombing, A. A., Aprilia, B., & Atiqoh, K. S. N. (2022). The impact of habits of mind on students' mathematical reasoning: The mediating initial ability. *Beta: Jurnal Tadris Matematika*, *15*(2), 119–134. https://doi.org/10.20414/betajtm.v15i2.540

Febrianti, S., Imamuddin, M., & Isnaniah. (2023). Analisis Kemampuan Pemecahan Masalah Matematika Dalam Menyelesaikan Soal HOTS Terintegrasi Nilai-Nilai Islami. *Ar-Riyadhiyyat: Jurnal Pendidikan Matematika*, *4*(1), 1–10.

Indriani, T., & Retnawati, H. (2025). The Effect of Habits of Mind on Students' Reasoning Ability through Mathematic Connections. *Jurnal Ilmiah Pendidikan Profesi Guru*, *8*(2), 293–306. https://doi.org/10.23887/jippg.v8i2.102173

Juanti, A., Aniswita, A., Imamuddin, M., & Risnawita, R. (2024). Kemampuan Numerasi Matematika Siswa Kelas VIII SMP Negeri 7 Bukittinggi. *Innovative : Journal of Social Science Research*, *4*(3), 16691–16705.

Kemendikbudristek RI. (2022). *Dimensi, Elemen, dan Subelemen Profil Palajar Pancasila dalam Kurikulum Merdeka*.

Mintarsih, M., & Prasetyono, H. (2025). Analisis Peran Kecerdasan Numerik Dan Kemampuan Berfikir Kritis Dalam Pemecahan Masalah Matematika Siswa Sekolah Dasar Di Kab. Karawang. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *10*(4), 305–317.

Miranti, N. (2020). *Pengaruh Kecerdasan Numerik Terhadap Kemampuan Penalaran Matematis Siswa Kelas VIII SMP Negeri 3 Bobotsari* [Bachelor Thesis]. IAIN Purwokerto.

Mullis, I. V. S., Martin, M. O., & Davier, M. von. (2021). *TIMSS 2023 Assesment Frameworks*. TIMSS & PIRLS International Study Center.

Pickering, J., Attridge, N., Inglis, M., & Morsanyi, K. (2025). Numeracy, logical reasoning and real-world decision making. *Research in Mathematics Education*, 1–17. https://doi.org/10.1080/14794802.2025.2472675

Putri, D. S., Zulkardi, Z., & Susanti, E. (2023). Student's Numerical Skills in Solving Mathematical Problems on Numbers Subject in Maksuba Cake Context. *Jurnal Pendidikan Matematika (Kudus)*, *6*(1), 59–70. https://doi.org/10.21043/jpmk.v6i1.17622

Rahma, N., Masrura, S. I., & M, A. M. (2025). Pengaruh Kemampuan Numerik dan Konsentrasi Belajar Terhadap Kemampuan Pemecahan Masalah Matematika Kelas VIII SMP Negeri 2 Majene. *Intellectual Mathematics Education (IME)*, *3*(1), 20–29. https://doi.org/10.59108/ime.v3i1.84

Rodliyah, I. (2021). *Pengantar Dasar Statistika*. LPPM Unhasy Tebuiring Jombang.

Saputri, V., Isnaniah, Aniswita, & Imamuddin, M. (2025). *Pengaruh Kecemasan Matematis dan Prokrastinasi Akademik Terhadap Hasil Belajar Matematika Siswa Kelas VIII MTsN 2 Lima Puluh Kota Tahun Pelajaran 2024/2025*. *6*(4), 566–580.

Suseno, I., Suendarti, M., Supeno, S., & Suhendar, Y. (2023). The Relevance of Mathematical Critical Thinking Skill with Numerical Intelligence and Learning Independence. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *13*(2). https://doi.org/10.30998/formatif.v13i2.16228

Vira, T. Y., & Aniswita, A. (2022). Kecerdasan Logis Matematis Terhadap Disposisi Matematis Siswa. *Dharmas Education Journal (DE_Journal)*, *3*(2), 160–166. https://doi.org/10.56667/dejournal.v3i2.663

Wahyuning, S. (2021). *Dasar-dasar Statistik*. Yayasan Prima Agus Teknik.

Zurahmah, Z., & Isnaniah, I. (2023). Pengaruh Kedisiplinan dan Kemandirian Belajar terhadap Hasil Belajar Matematika Siswa Kelas VIII SMPN 1 IV Koto Tahun Pelajaran 2022/2023. *Juring (Journal for Research in Mathematics Learning)*, *6*(2), 149. https://doi.org/10.24014/juring.v6i2.22330