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THE INFLUENCE OF VERBAL ABILITY ON MATHEMATICAL PROBLEM SOLVING ABILITY

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ABSTRACT

This study aims to determine whether there is an effect of verbal ability on students' mathematical problem solving abilities. This study includes a quantitative study with a population of all students of class XI MAS Tarbiyah Islamiyah Bayur. The sample was selected by total sampling technique. Data were collected through tests and analyzed by simple linear regression. The results showed that verbal ability had a positive effect on mathematical problem solving skills based on the regression equation Y = 12.081 + 0.870X. The significance level of the verbal ability variable is 0.000 which is smaller than 0.05, so verbal ability has a significant effect on mathematical problem solving abilities. Based on the correlation coefficient of 0.922, the direction of the relationship between verbal ability and mathematical problem solving ability is positive. This shows that the higher the verbal ability, the higher the mathematical problem solving ability of students, and vice versa. While the coefficient of determination is 0.851, this means that 85.1% of the mathematical problem-solving ability variable is influenced by the verbal ability variable, the remaining 14.9% is influenced by other variables.

Keywords: Verbal Ability, Mathematical Problem Solving Ability

A. INTRODUCTION

Mathematics is a universal science that forms the basis for the development of modern technology and plays an important role in various scientific disciplines that advance human thought (Maulyda, 2020). So that mathematics is closely related to everyday human activities. In learning mathematics, students are required to understand and apply it in their daily activities. The concepts in mathematics are arranged in a hierarchical, structured, logical, and systematic manner starting from simple concepts to complex or complex concepts. Mathematics contains prerequisite themes or concepts that become the basis for understanding subsequent themes or concepts. For example, mastering equation material requires an understanding of numbers or numbers, addition operations, multiplication operations, subtraction operations, division operations and so on (Suherman et al., 2003).

Problem solving ability is an ability that students need to have after participating in mathematics learning activities. This ability is very important for students to face real problems in everyday life (Susanto & Syaveta, 2018). Mathematics learning prioritizes improvements in problem-solving skills so that it can support students to understand the relationships between mathematical concepts and the relationships between science and other fields and mathematics (Gunur et al., 2018). Problem solving can build students' self-confidence in solving mathematical problems or problems. Students with the ability

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to solve mathematical problems can improve decision making in daily activities. Cooney said that having problem solving skills helps students to think analytically when making decisions in everyday life (La'ia & Harefa, 2021).

One of the factors that affect students' mathematical skills besides numerical ability is verbal ability. Verbal ability is the ability to understand ideas expressed through words. Verbal skills include word analogies, vocabulary, and word relationships. In every lesson this verbal ability is needed, including math lessons. The abilities that students need to possess and master are not only limited to numerical abilities, but also verbal abilities. This is because there are many symbols used in mathematics, either in the form of letters or non-letters (Daniyati & Sugiman, 2015). To be able to analyze problem solving questions well, students must have good verbal skills. Soeharno said that verbal abilities are very important in learning activities and can determine learning success, because students who have high verbal abilities can understand ideas and concepts and can easily think and solve problems expressed in words (Wahyuddin, 2016). Suwarsono said that mathematics educators have long thought that the ability to understand reading and understand verbal sentences has an influence on the success of mathematics learning. For example, to solve a problem that is presented in the form of words, students must first be able to read and understand it and then translate it into symbolic language, namely mathematical symbols (Manullang, 2003).

Based on interviews with mathematics educators at MAS Tarbiyah Islamiyah Bayur on March 13 2022, students' verbal abilities varied. There were students who were able to translate questions in the form of story questions into mathematical symbols, and there were also those who were not able to. There are students who do not understand the meaning or purpose of the questions in mathematical problem solving, there are also those who understand and there are those who just wait for answers from friends or wait for educators to explain the answers. Students sometimes do not carry out the fourth step in problem solving, namely checking the results of their work again, so that if there is a calculation error, students do not know about it. Students' lack of verbal skills is indicated by their difficulty in solving questions related to symbols and story-shaped questions. This can also be seen from the results of students' daily tests where the results of most students' scores are in the medium group at 28%, the low group at 16% and the very low group at 12%.

According to Yuliana L. Nahak et al, verbal ability is the ability to understand word relationships, vocabulary and accept certain words quickly, including the ability to remember words and the patterns that make them up. Verbal ability is a skill needed to learn mathematics. Verbal abilities help students to understand the relationships between words and vocabulary, so that students can understand and communicate and solve mathematical problems. In learning mathematics, verbal ability is one of the logical aspects needed to enable students to understand and interpret the problems they face. Verbal abilities will help students to solve mathematical problems in understanding

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meaning and creating mathematical models. On the other hand, students will experience difficulties in solving mathematical problems if their verbal skills are not good.

Similar research was conducted by Indah Rianaya in 2019 concerning "The Influence of Verbal Ability and Interest on the Mathematics Learning Outcomes of Grade VIII Students at SMP Negeri 1 Sumbergempol Tulungagung Academic Year 2018/2019. Based on the results of the study, it was found that there was an influence of each verbal ability and interest on learning outcomes and there was a joint effect of verbal ability and interest on learning outcomes (Rianaya, 2019).

Based on the description above, researchers conducted research to test the influence of verbal abilities on mathematical problem solving abilities. Researchers also saw how much influence the verbal ability had on mathematical problem solving abilities.

B. RESEARCH METHOD

This research is a quantitative research. Quantitative research uses numbers, when collecting data, interpreting data and presenting the results (Siyota & Sodik, 2015). This research is an ex post facto type of quantitative research or also called after the fact. This means that this research was carried out after the incident occurred. Ary explained that ex post facto research is research carried out after differences in independent variables occur due to the natural development of an event (Rukminingsih et al., 2020). The research was carried out from 16 to 18 June 2022 at Class XI MAS Tarbiyah Islamiyah Bayur which is located in Nagari Bayur, Agam Regency, West Sumatra. The population of this study was all students in class XI MAS Tarbiyah Islamiyah Bayur for the 2021/2022 academic year and the sample was selected using a total sampling technique. The variables in this research are the dependent variable, namely mathematical problem solving ability, the independent variables are numerical ability and verbal ability. The instruments used in this research were test questions consisting of verbal ability tests and mathematical problem solving ability tests.

The data analysis technique used in this research is simple linear regression analysis. In this analysis, proof of the hypothesis is carried out (Darwin et al., 2021). Regression is a tool for testing the influence of independent variables on the dependent variable. A simple linear regression model is a model that describes the functional relationship between two variables (Gani & Amalia, 2014). The first variable (Y) functions as the dependent variable, namely mathematical problem solving ability, while the second variable (X) functions as the independent variable, namely verbal ability.

The influence test is a test of whether or not there is an influence of an independent variable on the dependent variable for the regression model. The indicator used is the regression coefficient. If the regression model is not equal to zero then there is an effect, otherwise the regression coefficient has no effect if the regression model is equal to zero. The simple linear regression model is a model that describes the functional relationship

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between two variables. Meanwhile, to see whether it is significant or not based on the significant value obtained using the SPSS application, if the significance level is below 0.05, then the relationship is significant (Gani & Amalia, 2014). Before the simple linear regression analysis was carried out, the data normality and data linearity were tested first.

C. FINDINGS AND DISCUSSIONS

Before carrying out linear regression analysis, prerequisite tests are carried out including normality tests and linearity tests.

Data Normality Test

Data can be said to have a normal distribution if the difference between each observation point that is above the average and those that are below the average is relatively the same (Gani & Amalia, 2014). Here the researcher uses the SPSS application in the Normality Test with the results as in table 3 below:

Table 3. Data Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Verbal Ability	,148	25	,166	,942	25	,168
Mathematical Problem Solving Ability	,095	25	,200*	,968	25	,586

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

The results of the data distribution normality test obtained significant numbers above the alpha level of 0.05. This means that, using both the Kolmogorov-Smirnov and Shapiro-Wilk techniques, the distribution of data on numerical ability and mathematical problem solving ability is normal.

Data Linearity Test

Linearity testing is used to show that numerical ability data and mathematical problem solving ability data have a linear relationship with each other (Gani & Amalia, 2014). The results of the data linearity test were obtained through the SPSS application as shown in table 4 below:

Table 4. Data Linearity Test

		Sum of Squares	Df	Mean Square	F	Sig.
	(Combined)	1736,823	10	173,682	16,059	,000

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Mathematical Problem Solving Ability * Verbal Ability	Between Groups	Linearity	1605,950	1	1605,950	148,49	,000
		Deviation from Linearity	130,874	9	14,542	1,345	,299
	Within Groups		151,417	14	10,815		
	Total		1888,240	24			

Testing the linearity of the data for verbal ability variables on mathematical problem solving abilities, shows results that have a linear relationship with a significance number of F Linearity (0.000) smaller than the alpha level (0.05). These results indicate that we can use a linear regression model.

After all the tests are met, a Simple Linear Regression is then performed between numerical abilities and mathematical problem solving abilities.

Correlation Coefficient

The correlation coefficient is a number or number that shows the strength or weakness of the relationship between the independent variable (x) and the dependent variable (y) (Gani & Amalia, 2014).

Table 5. Verbal Ability Correlation Coefficient

		Mathematical Problem Solving Ability	Verbal Ability
Pearson Correlation	Mathematical Problem Solving Ability	1,000	,922
	Verbal Ability	,922	1,000
Sig. (1-tailed)	Mathematical Problem Solving Ability	.	,000
	Verbal Ability	,000	.
N	Mathematical Problem Solving Ability	25	25
	Verbal Ability	25	25

From the table above, a correlation value of 0.922 is obtained, which is at a very strong level, with a significance of 0.000. because the significance value obtained is less than 0.05. This means that there is a significant relationship between verbal abilities and mathematical problem solving abilities. Based on the positive correlation coefficient value, namely 0.874, the direction of the relationship is positive. This shows that the higher the verbal ability will be followed by the higher the students' mathematical problem solving abilities.

Coefficient of Determination

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The coefficient of determination is a number that states the proportion or percentage of variation in the change in the value of Y which is determined by the variation in the change in the value of X (Gani & Amalia, 2014). The coefficient of determination is sought to determine the magnitude of the contribution of the independent variable to the dependent variable (Sugiyono, 2018).

Tablel 6. Coefficient of Determination
Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,922[a]	,851	,844	3,5034	2,696

a. Predictors: (Constant), Verbal Ability
b. Dependent Variable: Mathematical Problem Solving Ability

From the table above, the R Square value is 0.851, this number is the result of the squaring of the correlation coefficient value, or 0.922 x 0.922 = 0.851). R Square (coefficient of determination), which means that 85.1% of the mathematical problem solving ability variable is influenced or explained by the verbal ability variable, the remaining 14.9% is influenced by other variables. R Square ranges from 0 to 1, the greater the value of R Square, the stronger the relationship between the two variables.

Verbal Ability Regression Equation

Table 7. Verbal Ability Regression Equation
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	12,081	6,194		1,950	,063
	Verbal Ability	,870	,076	,922	11,439	,000

a. Dependent Variable: Mathematical Problem Solving Ability

In the table above, the following regression model is obtained:
Y = 12,081 + 0,870X
Y = Mathematical problem solving abilities
X = Verbal ability
The value of mathematical problem solving ability is 12.081 + 0.870 verbal ability. A constant of 12.081 states that if there is no verbal ability, then mathematical problem solving ability is 12.081. A regression coefficient of 0.870 states that each addition (because of the positive sign) of one verbal ability score will increase students' mathematical problem solving abilities by 0.870.

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Based on the table, it is also found that the level of significance for the verbal ability variable is 0.000, which means that verbal ability has a significant effect on mathematical problem solving abilities.

In this study, most of the students' verbal abilities were in the medium category, as many as 9 people with a percentage of 36% and the average students' verbal abilities, namely 80.92, were in the high category. The results of a simple linear regression test showed that there was a positive and significant influence of verbal ability on mathematical problem solving ability. This means that every increase in verbal ability will have an impact on increasing problem-solving ability, meaning that the higher a student's verbal ability, the higher their mathematical problem-solving ability. This problem solving ability is influenced by verbal ability by 85.1% while the rest is influenced by other variables.

This research is in accordance with Soeharno's opinion which states that verbal abilities are very important in teaching and can determine students' success in learning, because with high verbal abilities, a person can easily think and solve problems expressed in words. This is in accordance with Mutmainna's research which found that there was an effect of verbal abilities on mathematics learning outcomes.

D. CONCLUSION

There is a significant positive influence between verbal ability and problem solving ability based on the regression equation Y=12.081+0.870x. From the coefficient of determination, it was found that 85.1% of the mathematical problem solving ability variable was influenced or explained by the verbal ability variable. This research is in accordance with Soeharno's opinion which states that verbal abilities are very important in learning and can determine students' success in learning, because with high verbal abilities, a person can easily think and solve problems expressed in words. This is in accordance with Mutmainna's research which found that there was an influence of verbal ability on mathematics learning outcomes.

To improve students' verbal abilities, educators should use an approach that emphasizes the structure and accuracy of language. For future researchers, especially in the field of mathematics education, to conduct further research on verbal abilities with other mathematical abilities or carry out further analysis of verbal abilities in mathematical problem solving abilities.

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