DPJPM
Delta-Phi: Jurnal Pendidikan Matematika
https://www.journal.assyfa.com/dpjpm

Delta-Phi: Jurnal Pendidikan Matematika, vol. 1 (1), pp. 86-90, 2023
Received 15 Feb 2023/Published 30 Apr 2023
https://doi.org/10.61650/dpjpm.v1i1.43

The Influence of Mathematical Logical Intelligence on Problem Solving Ability in Solving Story Problems

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Abstract

Students typically need help understanding a succession of stories, relating mathematical concepts, and formulating them logically, systematically, and critically. Thus, students' math skills still need to improve. Students' mathematical intelligence, which has yet to be employed to solve story-form questions, affects their math abilities. This study examines MTs Walisongo Sukajadi class VIII students' mathematical and logical abilities. This research is quantitative and ex post facto. This study included 25 MTs Walisongo Sukajadi class VIII pupils. This study randomly selected 25 pupils from the population. Data is collected using surveys and tests. Data analysis uses Simple Linear Regression. This research found that Y = -8.728 + 0.958X is the regression equation from the analysis above. Statistical hypothesis testing yields Fcount = 50.200 and Ftable = 4.22. Since Fcount > Ftable and 0.000 > 0.05, H0 was rejected. This suggests that mathematical and logical intelligence positively and significantly affects SPLDV tale problem-solving. The R2 value of 0.686 shows how much mathematical and logical intelligence affects problem-solving. After utilizing the determinant method was 68.6%, meaning logical intellect contributed 68.6% to problem-solving, whereas other variables contributed 31.4%.

Keywords: Logical-Mathematical Intelligence, Problem Solving, Story Problems.

Introduction

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students can develop their potential to have religious and spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves, society, and the country (Alemour, 2019; Elsakaan, 2018; Qin, 2017). To achieve mathematics learning objectives in learning activities, it is necessary to have learning that can encourage students to learn actively so that they can learn logically and honestly and understand it easily (Bayzidi, 2021; Gupta, 2021; Ruthotto, 2020).

Mathematics is one of the fields of study taught in elementary schools, junior high schools, and general high schools (Bukchin, 2018; Howlader, 2018; Root, 2017). Some say mathematics is the science of numbers and space (Garg, 2020; Taiwo, 2021; Tawhid, 2018). Therefore, mathematics is required at all levels of education, starting from elementary school, middle school, and college (Li, 2020; Ribas, 2019; Shah, 2018). The aim of mathematics lessons is so that students can solve problems, which includes the ability to understand problems, design mathematical models, complete mathematical models, and interpret the solutions obtained (Cholily et al., 2020; S. N. Hasanah et al., 2021; Sugianto et al., 2022).

Every teacher in mathematics learning is expected to be able to optimize students in mastering concepts and solving problems by thinking critically (Cholily et al., 2023), logically (Sekaryanti et al., 2022), systematically (Wicaksono et al., 2021), and structured (Baskoro et al., 2006). Based on Minister of Education and Culture Regulation Number 2 of 2016 regarding learning objectives, namely: (1) Understand mathematical concepts, describe the relationship between mathematical concepts, and apply concepts or logarithms efficiently, flexibly, accurately and precisely in solving problems, (2) Reason patterns like mathematics, developing or manipulating mathematics in constructing arguments, formulating evidence, or describing mathematical arguments and statements, (3) Solving mathematical problems which include the ability to understand problems, develop mathematical solution models, and provide appropriate solutions, and (4) Communicate arguments or ideas using diagrams, tables, symbols, or other media to clarify problems or situations (Astutik et al., 2022; Laila et al., 2023; Ningtyas et al., 2023).

The ability to solve mathematical problems can be known through students' questions in the form of descriptions because, from the form of the description questions, we can see the steps taken by students in solving a problem in the description questions in the form of story problems (Fatra et al., 2023; Martunis et al., 2023; Sudiantini et al., 2023). Many story questions are found in every discussion of the material. Because it is an example of everyday life, students' ability to solve story problems can be seen from the learning outcomes and the process of solving them (Dwirahayu et al., 2023; Rokhmawati et al., 2022; Yulianeta et al., 2021).

Based on the researcher's experience and information, MT Walisongo students still need to improve at working on and solving story problems. On average, MT Walisongo students prefer to avoid story problems. This can be seen from the students' learning results in the previous material, specifically for story questions; the SPLDV material scored 60, even though the minimum limit is 75. The factor of students' inability to solve story problems on SPLDV material is that students will need help understanding the meaning of the story problems. After all, they have difficulty changing the form of story questions on SPLDV material into mathematical models.

Based on the learning objectives of the mathematics problem, at least (Astuti et al., 2023; Jannah et al., 2023; Usmiyatun et al., 2023). One competency that students are expected to have after studying mathematics is problem-solving abilities, which undoubtedly play an essential role in the learning process; problem-solving can also be a learning method to train and improve problem-solving abilities in learning activities and mathematics problems. In problem-solving, there are indicators, including 1) Understanding the question or problem, 2) Making a plan or way to solve it, 3) Resolving the problem, and 4) Checking the results obtained and the learning steps.

Problem-solvingInternal factors and external factors can influence problem-solving; internal factors come from within the student himself, such as motivation, intelligence, self-confidence, independence, and attitude. Meanwhile, external factors, such as facilities and infrastructure, environment, teachers, curriculum, and teaching methods, come from outside the student. One of the internal factors that comes from within the student himself is intelligence. These two factors support each other, but internal factors dominate student learning success.

These factors are logical-mathematical intelligence and learning independence. Students with high logical-mathematical intelligence tend to understand a problem and analyze and solve a problem appropriately. Likewise, students with high logical-mathematical intelligence will have high learning outcomes in mathematics learning activities. Seeing the problem of the relatively low learning outcomes of class VIII MTs Walisongo students, the researchers were interested in researching: "The Influence of Mathematical Logical Intelligence on Problem Solving Ability in Solving Story Questions on SPLDV Material."

Research Methode

The type of method used in this research is quantitative research. According to Sugiyono, quantitative research methods can be interpreted as research methods that are based on the philosophy of positivism. The data collection technique uses research instruments; the data analysis is quantitative to test the established hypothesis (Mustakim et al., 2023).

This approach is a scientific method because it meets scientific principles, namely concrete, objective, measurable, rational, and systematic (Laila et al., 2022; Triono et al., 2023; Vidyastuti et al., 2018). Research with a quantitative approach emphasizes the analysis of numerical data (numbers), which are processed using statistical methods (Darmayanti et al., 2023). This research aims to determine whether the results of selected subjects are based on the I test score in the form of an algebraic form operation story.

Subject 1 (SU_1) is a subject of the upper group, while subject 2 (SU_2) is a subject of the middle group, and subject 3 (SU_3) is a subject of the lower group. Then, the results of the work of the three subjects were analyzed for errors based on the indicators of the Newman stages test questions—mathematical logic and linguistics on students' mathematical problem-solving abilities in solving story problems on SPLDV material. The data in this research are in the form of questionnaires and student test results.

In this research, researchers try to describe symptoms, events, and occurrences that are occurring at present using a questionnaire. This research includes a comparative or ex post facto method of the variables studied. According to Sugiyono, ex post facto is research carried out to examine events that have already occurred and look back to discover the factors that could have caused the incident9. This research was carried out at MTs Walisongo Sukajadi in class VIII in the odd semester of the 2022/2023 academic year.

According to Sugiyono, a valid instrument means the measuring instrument used to obtain valid data (Darmayanti, 2023). The instruments that must be validated are the mathematical, logical intelligence questionnaire sheet, problem-solving ability test sheet for solving story problems, and documentation. The results of the total average value for all aspects (Va) are then interpreted into validation, which is tested by the instrument and can be declared valid so that it can be used if the value of Va≥**3**. Research instruments can be used if they have reached valid or very valid criteria (Ahmed et al., 2023).

Meanwhile, if the instrument meets the criteria below valid, it needs to be revised by replacing the instrument; the tested questions are declared valid. In this research, a Likert scale is used, which is a scale used to measure people's opinions, attitudes, and perceptions of social events or phenomena (Rizki et al., 2023). With a Likert scale, the variables to be measured are described into variable indicators; these indicators are used as a starting point for compiling instrument items, which can be in the form of questions and statements (Darmayanti, 2022; Gunawan et al., 2023; Zahroh et al., 2023). The answer to each item on the instrument using a Likert scale has a gradation from very positive to very negative.

Descriptive analysis is carried out to determine a variable's high or low quality, namely, the problem-solving ability of the final score. Then, the average of all students' mathematical problem-solving ability scores will be calculated.

Results and Discussion

the research was carried out in the even semester on Tuesday, 17 February 2023, to 25 February 2023, with a research sample of 25 students, namely students who were in class VIII MTs Walisongo. There were 25 male students in the class, so the total number of subjects present during the research took the mathematical and linguistic logical intelligence test, and the mathematical problem-solving ability test was 25. The following is data on students in class VIII at MT Walisongo Sukajadi.

Data from logical-mathematical intelligence and mathematical problem-solving ability test results can be analyzed using SPSS for Windows version 17**.**

a) Normality test

The normality test proves whether the data obtained is usually distributed (zero residual). This normality test will test variable data (X) and variable data (Y).

Table 1. Normality Test Results.

		Logical-Mathematical Intelligence	Problem-solving skill
N			25
Normal Parameters	Mean	25	61.04
Most Extreme	Std. Deviation	72.80	10,784

differences	Absolute	13,235	,112
	Positive	,206	,112
Kolmogorov-Smirnov Z	negative	,151 -.206	-.106 ,561
Asymp. Sig.(2-tailed)		1,030	,911
		,239	

Test distribution is Normal.

The Kolmogorov Smirnov test on SPSS with a significance level of α = 0.05 shows that sig. Mathematical Logical Intelligence is 0.239 and sig. Mathematical Problem-Solving Ability is 0.911, which means both are greater than 0.05, so it can be concluded that the research sample data comes from a normally distributed population.

b) Linearity Test

The linearity test determines whether the independent variable data has a linear relationship with the dependent Variable. This test is usually used as a prerequisite in applying the linear regression method.

Table 2. Linearity Test Results

	Sum Of Squares	Df	Mean Square	F	Sig.
Solution Between Group (Combined)		9			
Problem Linearity		1			
Logical intelligence		8	262.121	9.104	,000
Deviation	2359.093	15	1914.015	66,479	,000
From	1914.015	24	55,635	1,932	,129
Linearity	445,078		28,791		
	431,867				
Within Group	2790.960				
Total					

According to the ANOVA test on SPSS with a significance level of α = 0.05, it shows that sig. Deviation from Linearity is 0.129, meaning a significant linear relationship exists between the variables Mathematical Logical Intelligence (X) and Mathematical Problem Solving Ability (Y).

c) Simple Regression Test

The Simple Regression Test aims to forecast or predict the magnitude of the value of the dependent Variable, which is influenced by the independent variable, so it can determine whether mathematical, logical intelligence influences students' mathematical problem-solving abilities.

Table 3. Simple Regression Test Results for Coefficients Research Data

Model	Unstandardized Coefficients		Standardized Coefficients	Q	Sig.
	B	Std.Error	Beta		
1(Constant)	-8,728	9,924	,828	-.879	,388
Intelligence Logical	,958	.135		7.085	,000

Dependent Variable: Problem Solving

In the coefficients table, in column B, the constant (a) is -8.728, while the value of X(b) is 0.958, so the regression equation can be written as:

Y = a + b. X
= -8.728 + 0.958X

The coefficient b is called the regression direction coefficient and states the average change in variable Y for every change in variable X of one unit. This change increases if b is positive and decreases if b is negative. So from this equation, it can be translated as:

a) The constant of -8.728 states that if there is no X value, then the Y value is -8.728
b) The X regression coefficient of 0.958 states that for every additional 1 X value, the Y value increases by 0.958.

Table 4. Simple Regression Test Results for Anova Research Data

Model		R	df	Mean Square	AdjustedR Square	Std. Error of the Estimate
1	Regression		1		50,200	. 000a
	n	1914.015	23	19914.015		
	Residual	876,945	24	38.128		
	Total	2790.960				

Predictors: (Constant), Logical intelligence
Dependent Variable: solving

In the table above, the resulting value is F-count = 50.200 and F-table = 4.22, which means F-count > F-table. So, H0 is rejected, which means that mathematical and logical intelligence influence problem-solving abilities in solving story problems on SPLDV material.

Table 5. Simple Regression Test Results for Research Data

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.828a	,686	,672	6,175

a. Predictors: (Constant), Intelligence
b. Dependent Variable: Solution

Then, to find out how much the contribution of mathematical logical intelligence influences problem-solving abilities, it can be seen in Table 5 that the Summar Model output shows an R2 value of 0.686. Then, after calculating using the determinant formula, it was found to be 68.6%, which means that logical intelligence contributed 68.6% to problem-solving abilities, while other variables influenced the remaining 31.4%.

This research was conducted to determine the influence of mathematical and logical intelligence on problem-solving abilities in class VIII SPLDV material at MTs Walisongo Sukajadi.

The analysis results show that the regression equation obtained is Y = -8.728 + 0.958X. Based on statistical hypothesis testing, Fcount = 50.200 and Ftable = 4.22. So, the decision was made that H0 was rejected because Fcount > Ftable and the magnitude of significance was 0.000 > 0.05, meaning that mathematical and logical intelligence positively and significantly influenced the ability to solve story problems on SPLDV material.

The regression equation can predict the dependent Variable. This is proven by the results of the significance test of the regression coefficient of the logical intelligence variable (b), which shows that it is significant because the t-count value = 7.085 and t table = 1.714. So, t-count > t-table, the significance level is 0.000 > 0.05. So, mathematical and logical intelligence can predict problem-solving abilities in SPLDV story problems. So, the regression equation can be explained as follows:

The constant of -8.378 states that if the value of mathematical, logical intelligence is 0, then the value of solving ability on SPLDV story problems is -8.378. The regression coefficient of 0.958 has a positive sign, indicating that each additional value of 1 point for the value of mathematical, logical intelligence will increase the value of problem-solving ability in SPLDV story questions by 0.958. Conversely, if the value of mathematical, logical intelligence decreases by 1 point, the value of problem-solving ability in SPLDV story questions is 0.958. From the equation, it can be seen that the coefficient b is positive, indicating that the change in the direction of Y is in the same direction as the change in the direction of X. So the value of Y will increase if X increases; the value of Y will decrease if X decreases. So, the ability to solve problems on SPLDV story questions is directly proportional to mathematical and logical intelligence (Carpenter, 2020; Lewis, 2018; Xu, 2020).

From the analysis above, it can be stated that the hypothesis in this research, namely "There is an influence of mathematical, logical intelligence on the ability to solve story problems on SPLDV material," can be accepted (Cahyadi et al., 2023; N. Hasanah et al., 2023; Mubarok et al., 2023). Mathematical, logical intelligence includes a person's ability to think inductively or deductively, think according to logical rules, understand and analyze number patterns, and solve problems using thinking or reasoning skills (Anshori, 2021; Fani et al., 2018; Syaiful, 2019). Problem-solving is a strategy for transferring a concept or skill to a new situation so that students can practice interpreting the concepts (Nafisah et al., 2023; Setiyanti et al., 2022; Suharsiwi et al., 2023), theorems and skills they have learned. From the explanation above, mathematical and logical intelligence can help solve problems; it can also help find ways of working, patterns, and relationships, develop problem-solving skills, and improve memory.

Conclusion

The results of the logical-mathematical intelligence of class VIII MTs Walisongo Sukajadi students were grouped into three categories: (1) 1 student was in the low category. (2) as many as 6 students are classified in the medium category. (3) As many as 18 students are classified in the high category. So, the results of the logical-mathematical intelligence of class VIII MTs Walisongo Sukajadi students are in the high category.

The results of the mathematical problem-solving abilities of class VIII students at MTs Walisongo Sukajadi in solving story problems on SPLDV material were grouped into four categories, namely 0 students in the outstanding category, 1 student in the excellent category, 10 students in the fair category, and 14 students in the poor category. And has an average of 61.04, which is classified as sufficient. So, the results of the mathematical problem-solving abilities of class VIII MTs Walisongo Sukajadi students in solving March SPLDV story questions are in the sufficient category.

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