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The Influence of Mathematics Numeration Literacy Ability on Students' Critical Thinking

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Abstract

This study aims to determine the influence of mathematical numeracy literacy skills on students' critical thinking skills in the geometry transformation material in class XI even semester. Research conducted at MA Daarul Uluum Lido Bogor uses quantitative methods that are correlational. The data collection technique used was cluster random sampling in the form of tests and non-tests. The results of this study concluded that mathematical numeracy literacy skills greatly influence students' critical thinking, especially in geometric transformation material.

Keywords: Critical thinking ability, Mathematica, Numeracy literacy ability.

1 INTRODUCTION

One of the roles of education in learning is to develop the potential of students (Lena et al., 2020). As stated in the National Education System Law Number 20 of 2003 that "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state". Education is a way of educating in a good way according to the circumstances and conditions of the times (Meliantina, 2019).

Mathematics learning is a thinking process divided into several types, namely logical, analytical, creative, and critical thinking (Setiawan & Royani, 2013). This is based on Permendiknas No. 22 of 2006 concerning content standards for education and secondary education that mathematics subjects need to be encouraged for all students to equip the ability to think logically, analytically, systematically, critically, creatively and the ability to work together. In this case, critical thinking is one of the objectives mentioned in the Permendiknas and is a competency in the mathematics curriculum that students must have (Maryati, 2018).

Critical thinking is very necessary in life in society, because in life in society we are always faced with problems that require solving. One of them is in solving math problems, students are required to be able to use their critical thinking skills in order to solve these problems. Critical thinking can be honed in the learning process, where there is a systematic process that allows students to formulate and evaluate to convince the opinions that have been given (Fitria, Nugraheni, & Maryam, 2023). Critical thinking also trains a learner to be good at reading the situation of each problem, evaluating and making conclusions on these conditions so that the understanding ability that is built will be stronger and not easily forgotten.

In addition, critical thinking also brings students to develop following the competition in today's development. Problem-solving exercises in the form of varied problems can be

a skill in critical thinking and as one of the benchmarks for the level of critical thinking ability.

Therefore, teachers as educators must be able to find and practice students' thinking skills, so that the achievement of critical thinking can be achieved with a deeper understanding. So that teachers as educators and students as learners can carry out learning in accordance with the objectives of national education. To measure the extent of critical thinking skills, researchers made initial observations first.

The results of preliminary observations at MA Daarul Uluum Lido with the material used Equations and quadratic functions this material was chosen as the initial stage to see the critical thinking skills mastered by students. In this material, students need to identify and understand the problems from the questions contained in the task sheet. From some students' answers in the initial observation, it was found that 65% of students scored <75. And it was noticed from the students' answers that many students were not careful in representing the relationship given in the problem, even though the strategy or method chosen to solve the problem was correct.

2 RESEARCH METHODS

This research uses quantitative methods with correlation methods and research designs in the form of tests and non-tests. The population used in the study were students of class XI MA Daarul Uluum Lido Bogor who had been known that the ability to present the relationship given in the problem was very low and less thorough even though the strategy or method chosen to solve the problem was correct.

The sampling technique used cluster random sampling which is a random sampling technique from data sources that represent all class XI MA Daarul Uluum Lido Bogor. Shuffled and taken randomly or randomly.

The research instrument used is a non-test instrument containing 35 statements in the form of a questionnaire as a tool used to measure mathematical numeracy literacy skills and a test instrument containing 6 questions in the form of essay questions to measure students' critical thinking skills. Through the test instrument given to students, the researcher calculates the validity test, reliability, difficulty level, and differentiating power to find out which questions are valid and can be used to collect research data.

The data collection techniques used in this study were non-test, observation, and documentation. Before the research was conducted, the researcher made observations to class XI MIA. Furthermore, researchers conducted research taking data with instruments that had been validated.

3 RESULT AND DISCUSSION

According to Johnson and Rising (in Rifal, Sudia, & Masi, 2017) stated that mathematics is a pattern of thinking, a pattern of organizing, logical proof, mathematics is a language that uses terms that are carefully defined, clear and accurate representation with symbols and solid, more of a symbol language about ideas than about sound. Based on the explanation above, mathematics is organized structured knowledge, the properties in theories are made deductively based on undefined elements, axioms, properties or theories that have been proven correct which requires reasoning and thinking.

In addition, critical thinking in mathematics has several conditions, namely: (1) There is an unfamiliar or familiar situation so that an individual cannot directly recognize mathematical concepts or know how to determine the solution to a problem; (2) Using the knowledge they have, mathematical reasoning and cognitive strategies; (3) Generating generalization, proof and evaluation; (4) Reflective thinking that involves communicating

a solution, rationalizing arguments, determining other ways to explain a concept or solve a problem and developing further studies.

The importance of developing critical thinking skills in learning mathematics is needed because critical thinking and mathematics are inseparable. Numeracy Literacy Skills in the researcher.

Table 1. Mathematical Numeracy Literacy Levels According to PISA

Level	Indicator
1	Answers the question with the known context and all relevant information from the clear question. Gathers information and performs ways of solving according to clear instructions..
2	Interprets, recognizes situations, and uses formulas in solving problems.
3	Carry out procedures well and select and apply simple problem-solving strategies. Interpret and present situations.
4	Work effectively with models in concrete but complex situations and present different information and relate it to real situations.
5	Work with models for complex situations and select and apply strategies in solving complex problems..
6	Make generalizations and use mathematical reasoning in solving problems and communicating them.

The data in this study consisted of data on the ability of mathematical Numeracy Literacy (Y) and critical thinking ability (Y). And critical thinking ability (Y) data of students of class XI-MIA MA Daarul Uluum Lido Bogor. Data for mathematical numeracy literacy skills were obtained by distributing questionnaires totaling 35 statement items in which there were negative and positive statements with a score of 5-1 for positive statements and a score of 1-5 for negative statements adjusted to the gradation of words. Based on the results of calculations using the Microsoft Excel program, the average score of students' mathematical numeracy literacy skills = 109.05; median = 108; mode = 113.5; variance = 272.57; standard deviation = 16.51; the highest score is 159 and the lowest score is 75.

The frequency distribution of data on mathematical numeracy literacy skills is seen in Table 2.

Table 2. Frequency Distribution of Mathematical Numeracy Literacy Skills

Interval Class	Frequency	Relative Frequency
75-88	3	8.6%
89-103	11	31.4%
104-117	11	31.4%
118-131	7	20%
132-145	2	5.7%
146-159	1	2.9%
Total	35	100%

To facilitate the interpretation of the frequency distribution table of mathematical numeracy literacy skills above, the histogram graph of the mathematical literacy skills variable will be presented in Figure 1.

Data for mathematical critical thinking skills are obtained through tests with story problems on Geometric Transformation material totaling 6 items. Each score has a score of 0-10 points, the total score of 6 items theoretically is between 0-60. Based on the results of calculations using the Microsoft Excel program, the average score of students' mathematical critical thinking ability= 36.4; median= 33; mode= 28.21; standard deviation= 14.85; variance= 220.67; the highest score is 63 and the lowest score is 9. The frequency distribution of data on mathematical critical thinking skills is seen in Table 3.

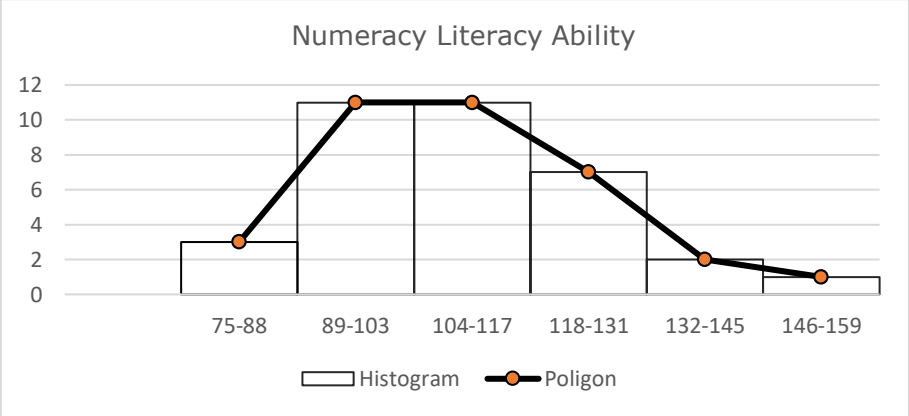


Figure 1. Math Numeracy Literacy Histogram

To facilitate the interpretation of the frequency distribution table of mathematical numeracy literacy skills above, the histogram graph of Students' Critical Thinking Skills variable will be presented in Figure 2.

Table 3. Frequency Distribution of Students' Critical Thinking Skills

Interval Class	Frequency	Relative Frequency
9-17	3	8.6%
18-26	7	20%
27-35	9	25.7%
36-44	4	11.4%
45-53	7	20%
54-62	4	11.4%
63-71	1	2.9%
Total	35	100%

This test is carried out to determine whether the data collection on the distribution of data in a group of data or variables is normally distributed or not. Testing the normality of Y error on X. In this study it is known that L_{count}=0.149. Based on the results of the normality test using the Liliefors formula at the significance level α= 0.05 with the test criteria normally distributed if the value $L_{count}<L_{table}$. and abnormally distributed if, then the results of each variable are obtained, it is presented in Table 4.

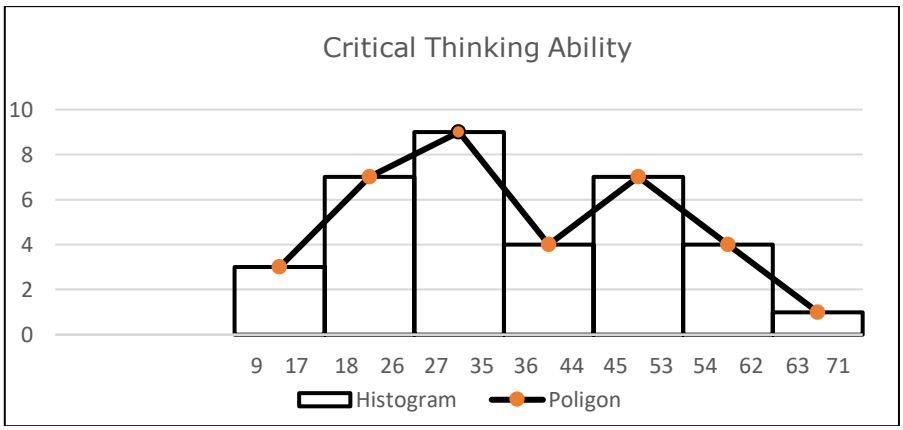


Figure 2. Histogram Of Students' Critical Thinking Skills

Based on Table 4, it is clear that each variable count statistical, $L_{count}<L_{table}$, thus the decision taken is H_0 accepted or the sample comes from a normally distributed population.

Then the regression analysis of the research data between the critical thinking ability variable (Y) and the Numeracy Literacy ability variable (X) produces a regression direction of (-57.882) and a constant of 0.8551X so as to produce points drawn in the scatter diagram and the regression equation is a straight line from the bottom left to the top right, then the variables X and Y have a linear relationship with the regression line equation $\hat{Y}$= -57.882+0.8551X. The following will present a scatter diagram showing that variables X and Y have a linear relationship.

Table 4. Summary of Normality Test Analysis

Variabel	L_{count}	L_{table}	Description
Numeracy Literacy Ability	0.087	0.149	Normal
Critical Thinking Ability	0.102	0.149	Normal

The regression equation means that if you do not have math Numeracy Literacy skills, you have critical thinking skills and if there is an increase in math Literacy skills by one unit, there will be an increase in critical thinking skills by 0.8551 units.

Followed by the results of the calculation of the correlation coefficient between the math Numeracy Literacy ability variable and critical thinking ability obtained a correlation coefficient of 0.950. This figure shows that the correlation coefficient between variables is in the high and positive category, which means that the contribution of variable X affects variable Y. Then based on the calculation of the simple linear regression test using the Microsoft Excel program, the value β=0.8551 is obtained with a significance value of (-57.882). According to the decision criteria that (-57.882)<0.05, it means that $H0$ is rejected and H_1 is accepted. Thus indicating that there is a significant influence of the math Numeracy Literacy ability variable on students' critical thinking skills. And continued with the coefficient of determination test obtained results with a value of 90.25%, which means that 90.25% of the variation in critical thinking ability is determined by the ability of mathematical numeracy literacy. The following is a summary of hypothesis test analysis in Table 5.

Table 5. Summary of Hypothesis Test Results

Coeficien	r_{xy}	r_{xy}^2	Contribution
X dan Y	0.950	0.9025	90.25%

The results of the analysis test prove that math numeracy literacy and critical thinking skills have a linear and significant relationship. Hypothesis testing also shows that math Numeracy Literacy ability has a significant effect on critical thinking ability with a significance level of (-57.882), which means (-57.882)<0.05 with a value of β=0.8551, then H_0 is rejected and H_1 is accepted. This shows that the higher the math Numeracy Literacy ability, the higher the critical thinking ability.

Based on the analysis and hypothesis testing that has been carried out, it shows that the statistical hypothesis proposed in this study can be accepted. The determination value is 90.25%, so it can be said that 90.25% of the variance in students' critical thinking ability can be explained by the ability of mathematical numeracy literacy. It also shows that students' math numeracy literacy skills contribute 90.25% to their critical thinking skills. Math Numeracy Literacy is not the only variable that can play a role in critical thinking ability (Ayu & Syukur, 2023; Endrayanto, 2021), because there are other factors that can affect this variable.

3 CONCLUSION

Based on the results of the analysis test, it proves that math numeracy literacy and critical thinking skills have a linear and significant relationship. Hypothesis testing also shows that

math numeracy literacy has a significant effect on critical thinking skills with a significance level of (-57,882), which means (-57,882)<0.05 with a value of β=0.8551, then H_0 is rejected and H_1 is accepted. This shows that the higher the math numeracy literacy ability, the higher the critical thinking ability.

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