Description Of Mathematical Communication Skills, Logical Thinking And Its Influence On The Ability Of Mathematical Literacy For Students Of Grade V Elementary School

Armanda Bahtiar, Agustan Syamsuddin, Irwan Akib

Abstract: This research paper aims to describe the influence of mathematical communication skills, logical thinking towards mathematical literacy skills in students grade V of elementary School in Somba Opu Sub-district, Makassar. This research paper uses the ex-post facto design. The instruments used are mathematical communication tests, logical thinking tests and mathematical literacy tests. Research sample is 316 students grade V of elementary School. The research data is analyzed with descriptive and inferential statistics. Descriptive analysis includes mean, median, variance, skewness, kurtosis, minimum value, maximum value and frequency distribution. While for inferential analysis used double linear regression analysis because researchers want to test whether there is a influence of mathematical communication skills, logical thinking towards mathematical literacy skills. Based on data analysis results, acquired t-count 9.298 > 1.967 with a significance of 0.000 < 0.05 so that it can be concluded that mathematical communication is influential towards mathematical literacy. While for the variables of logical thinking acquired t-count 8.606 > 1.967 with significance 0.000 < 0.05 so that it can be concluded that logical thinking affects the mathematical literacy. Furthermore, obtained F-count 221,312 > F-table 3.03 with significance 0,000 < 0.05 hence it can be concluded that the ability of mathematical communication and logical thinking of students jointly affects the students' mathematical literacy skill.

Index Terms: mathematical communication, logical thinking, mathematical literacy.

1. INTRODUCTION

Mathematics is a fundamental science underlying the development of other sciences. Math is therefore one of the subjects that is important to be taught in school. The NCTM [1] formulates mathematical learning skills called mathematical power including: (a) learning to communicate (mathematical communication), (b) learning for mathematical reasoning, (c) learning to solve problem (mathematical problem solving), (d) learn to associate an idea (mathematical connection), (e) learn to representing. The nature of learning is the conscious effort of a teacher to teach the students (directing student interactions with other learning resources) in order to achieve the learning objectives. However, the mathematical communication skills of the students are still relatively low. It is in accordance with the opinion of Rachmayani [2] stating that the mathematical communication skills are still low. In line with that, according to Muharom [3], the learning carried out only emphasizes on the demands of the curriculum so that students are passive in the learning process, the involvement of students tends to be minimum so that result in the skills of reasoning and the mathematical communication of the students is poorly developed. According to Lestari and Yudhanegara [4] suggests that the ability of mathematical communication is the ability to convey the idea mathematically, both orally and writing and the ability to understand and accept people's mathematical ideas carefully, analysis, critical, and evaluative to sharpen the understanding. Therefore, the skills of mathematical communication students need to be a focused attention in mathematics learning.

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Students should be able to solve mathematical problems by developing the mindset so that students can think rational in learning mathematics [5]. Widyastuti and Pujiastuti [6] suggest that the ability of rational thinking or logical thinking is an ability that needs to be developed to optimize the development of the left brain. Understanding the concepts and abilities of logical thinking requires a knowledge of the experience by the students themselves. Therefore it takes the role and effort of the teacher to motivate, train and explore all the skills and knowledge of students [7]. Logical thinking is necessary for a student to study mathematics [8]. The math learning process should sharpen logical thinking skills in order to improve learning outcomes and also facilitating students' understanding in mathematics learning [9]; [10]. By thinking logically, students' understanding of the mathematical concepts which is being studied will be higher. Syawahid and Putrawangsa [11] state that students' ability to analyse, give reason, formulate, use and interpret mathematics in a variety of contexts is called mathematical literacy. Further, it includes mathematical reasoning and uses concepts, procedures, facts and mathematical tools to illustrate, explain and predict phenomena. In addition, the concept of mathematical literacy can help students in knowing the role of mathematics in life and make the judgment and decisions rationally and logically required by constructive citizens, active and reflective [12]. Based on the results of the survey conducted by PISA 2015 [13], Indonesia is one of 10 countries with low mathematical literacy skill by only occupying the position of 64 from 72 countries and in 2018 Indonesia only occupied the position of 74 from 79 countries surveyed by PISA [14]. The average score of Indonesian students for mathematical literacy skills is 379 (Level 1) while the average international score is 500 (Level 3). Level 1 is the lowest level of the 6 levels of mathematical literacy skills applied by PISA. PISA (2012) [12] explains that mathematical literacy is interpreted as a person's ability to formulate, apply and interpret mathematics in a variety of contexts, including mathematical reasoning and

using concepts, procedures, and facts to illustrate, explain, or estimate phenomena. Mathematical literacy helps the people to understand the role or usefulness of mathematics in everyday life while using it to make the right decisions as citizens who build, care and think. Based on the explanation above, researchers are trying to explore whether there is any influence of mathematical communication skills, logical thinking on the ability of mathematical literacy of elementary school students' grade V.

2 METHOD

Ex post facto research design was chosen to trace the influence of mathematical communication skills, thinking logically on the ability of mathematical literacy in elementary school students' grade V. Data obtained from the questionnaire given to 316 students grade V of elementary school in the subdistrict Somba Opu involved as samples of research. The instruments used are mathematical communication tests, logical thinking tests and mathematical literacy tests. The Data obtained through the instruments used are subsequently analyzed using a descriptive and inferential statistical analysis. Descriptive analysis technique is necessary to describe the data of the proposed research variables. Whilst, descriptive analytical techniques includes mean, median, variance, skewness, kurtosis, minimum value, maximum value, and frequency distribution tables. Data on mathematical communication skills, logical thinking, and mathematical literacy are gathered through tests. For inferential analysis used double linear regression analysis because researchers want to test whether there is a influence of mathematical communication skills, logical thinking towards mathematical literacy skills. To facilitate the calculation process, researchers use SPSS 21.0 for Windows. The criteria used are mathematical communication variables affecting the mathematical literacy, if T=t-count < t-table with the significance value obtained < Alpha value 0.05. This also applies to the variable of logical thinking affecting mathematical literacy if t-count < t-table with the significance value obtained < Alpha value 0.05. For the subsequent test-F, to know the influence of mathematical communication and thought logically influential towards mathematical literacy if F-count > F-table with significance value obtained < value of Alpha 0.05.

3 RESULTS

3.1 Descriptive Statistical Analysis Results

Here is the result of a descriptive statistical analysis obtained based on the score of each mathematical variable communication, logical thinking, and the mathematical literacy of Grade V students in the Somba Opu subdistrict, Gowa District.

TABLE 1.

DESCRIPTIVE STATISTICS OF MATHEMATICAL COMMUNICATION SKILLS, LOGICAL THINKING, MATHEMATICAL LITERACY AND MATHEMATICAL LEARNING OUTCOMES

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Mathematical communication	316	67.75	11.56654	-.349	.137	-.574	.273
Logical Thinking	316	68.46	11.68782	-.687	.137	.102	.273
Mathematical literacy	316	72.69	10.38832	-.438	.137	-.215	.273
Valid N (list wise)	316						

3.1.1 Mathematical Communication Skills

The results of a descriptive analysis related to the score of mathematical communication variables in grade V Elementary School in Sombaopu subdistrict of Gowa District are presented in table 1. Output display results of the SPSS are known that the average student mathematical communication skills score is 67.7532 with a standard deviation of 11.56654 from the ideal 100 score that students may reach. Skewness and Kurtosis is a measure to see whether the value data of mathematical communication skills is distributed normally or not. Skewness measures the slope of temporary data and kurtosis measures the culmination of data distribution. Data is said to be a normal distribution if the skewness and kurtosis values are approaching zero and the skewness ratio value is at a value range of-2 to 2. Output display results SPSS gives the value of skewness and kurtosis respectively-0.349 and-0.574. Thus, it is seen that the value data of mathematical communication skill is distributed normally. The following are the frequency distribution data related to the mathematical communication capabilities presented in Table 2 below.

TABLE 2.

FREQUENCY DISTRIBUTION OF MATHEMATICAL COMMUNICATION SKILLS

Interval	Frequency
40 - 49	22
50 - 59	53
60 - 69	78
70 - 79	105
80 - 89	55
90 - 100	3
Total	316

3.1.2 Logical Thinking

The results of the descriptive analysis related to the variable score of logical thinking students grade V in elementary school of Somba Opu district Gowa Regency presented in Table 1. Output display results of the SPSS known that the average logical thinking of students is 68.4652 with a standard deviation of 11.68782 of the 100 ideal score that the students might achieve. Skewness and Kurtosis is a measure to see whether the value data of mathematical communication skills is distributed normally or not. Skewness measures the slope of temporary data and kurtosis measures the culmination of data distribution. Data is said to be a normal distribution if the skewness and kurtosis values are approaching zero and the

skewness ratio value is at a value range of-2 to 2. The values of skewness and kurtosis respectively-0.687 and 0.102. Therefore, it can be seen that the data of logical thinking value is distributed normally. The following frequency distribution data is related to the logical thinking skill presented in Table 3. following.

TABLE 3.
FREQUENCY DISTRIBUTION OF LOGICAL THINKING

Interval	Frequency
30 – 49	22
50 – 59	36
60 – 69	92
70 – 79	103
80 – 89	61
90 - 100	2
Total	316

3.1.3 Mathematical Literacy

The results of the descriptive analysis related to the variable score mathematical literacy of students' grade V in the Somba Opu subdistrict Gowa Regency is presented in table 1. Output display results of the SPSS are known that the average mathematical literacy score of students is 72.6978 with a standard deviation of 10.38832 from the ideal score of 100 that the students may reach. Skewness and Kurtosis is a measure to see whether the value data of mathematical communication skills is distributed normally or not. Skewness measures the slop of temporary data and kurtosis measures the culmination of data distribution. Data is said to be a normal distribution if the skewness and kurtosis values are approaching zero and the skewness ratio value is at a value range of-2 to 2. The values of skewness and kurtosis respectively-0.438 and-0.215. Thus, it can be seen that the value data of mathematical communication skill is distributed normally. The following is frequency distribution data related to student literacy skill presented in Table 4.

TABLE 4.
MATHEMATICAL LITERACY FREQUENCY DISTRIBUTION

Interval	Frequency
40 – 49	7
50 – 59	25
60 – 69	85
70 – 79	95
80 – 89	94
90 - 100	10
Total	316

3.2 Inferential Statistical Analysis Results

Furthermore, to identify the influence of mathematical communication skills, logical thinking on the ability of student mathematical literacy, inferential analysis using double regression analysis is conduct. The results of analysis obtained as follows.

TABLE 5.
RESULTS OF T-TEST ANALYSIS RELATED TO THE INFLUENCE OF MATHEMATICAL COMMUNICATION SKILLS, LOGICAL THINKING TOWARDS MATHEMATICAL LITERACY SKILLS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21,240	2,475		8,581	,000
	Mathematical communication skills	,394	,042	,439	9,298	,000
	Logical thinking	,361	,042	,406	8,606	,000

a. Dependent Variable: Mathematics literacy

From the table above it can be explained that the mathematical communication variable obtained by t-count 9.298 < 1.967 with significance of 0.000 < 0.05 so that it can be concluded that mathematical communication is influential on mathematical literacy. While for variables of logical thinking acquired T calculate 8.606 > 1.967 with significance 0.000 < 0.05 so that it can be concluded that logical thinking affects mathematical literacy. Furthermore, testing was conducted to see whether mathematical communication skills, logical thinking jointly influence the ability of students' mathematical literacy. From the results of the analysis obtained the following description presented in the form of Anova table.

TABLE 6.
RESULTS OF TEST-F ANALYSIS RELATED TO THE INFLUENCE OF MATHEMATICAL COMMUNICATION SKILLS, LOGICAL THINKING TOWARDS MATHEMATICAL LITERACY SKILLS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19912,713	2	9956,357	221,312	,000[b]
	Residual	14081,175	313	44,988		
	Total	33993,888	315			

a. Dependent Variable: Mathematical Literacy

b. Predictors: (Constant), Logical Thinking, Mathematical communication

According to the table above it can be explained that F-count 221.312 > F-table 3.03 with significance 0,000 < 0.05 so that it can be concluded that the independence of learning and anxiety of learning students jointly affects the learning achievement.

4 CONCLUSION

Based on the results of the data analysis described, obtained t-calculation 9.298 < 1.967 with a significance of 0.000 < 0.05 so that it can be concluded that mathematical communication is influential towards mathematical literacy. While for variables of logical thinking acquired t-count 8.606 > 1.967 with significance 0.000 < 0.05 so that it can be concluded that logical thinking affects the mathematical literacy. Furthermore, the test results are conducted to see if mathematical communication skills, logical thinking jointly influence mathematical literacy skills of students, obtained F-count 221,312 > F-table 3.03 with the significance 0,000 < 0.05 so that it can be concluded that the ability of mathematical communication, logical thinking of students jointly influence the students' mathematical literacy skill.

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