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THE INFLUENCE OF MATHEMATIC COMMUNICATION ABILITY TO THE UNDERSTANDING OF MATHEMATICAL CONCEPT ABILITY

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ABSTRACT. The purpose of this study is to determine the direct and indirect effects between the variables of mathematical communication skills and the ability to understand mathematical concepts. The research method uses the path analysis method. The population is grade IX students of Bengkulu City Public Middle School in the Even Semester 2018/2019 Academic Year, amounting to 587 respondents from the high, medium and low school categories. Sampling was carried out with proportional stratified random sampling, totaling 232 respondents. Likert scale instruments are used in data collection. Data were analyzed using path analysis techniques. The results of the study with a significance level of 5%, showed that there was a significant positive direct effect between mathematical communication skills ($\beta yx_3 = 0{,}224$) on the ability to understand students' concepts.

Keywords: communication, concept understanding

1. INTRODUCE

Mathematics is a universal science. That is, most of the existing scientific disciplines (outside mathematics), directly or indirectly utilize mathematical concepts. Understanding these mathematical concepts requires confidence from students to be able to solve mathematical problems that they have considered complicated or difficult. Students are required to have confidence in working on mathematical problems with the aim that students have a liking in advance of mathematics lessons. The feeling of love for mathematics lessons that can be shown by students is that first students must be able to understand mathematical concepts by means of students being able to communicate these mathematical solutions with their own understanding. So, students 'confidence in the understanding of mathematical concepts that students consider difficult will emerge if the students' representational and communication skills continue to be prioritized when working on math problems. Based on the researchers' experience while teaching mathematics at school, many students do not achieve mastery in learning because students only imitate the way to solve problems in books and students only understand the problem solving given for example by the teacher without understanding the questions that are different from the examples given. Initiatives and creativity of students lacking in learning mathematics [1].

According to Bengkulu Province Education and Culture sources in 2018, the average score of the National Mathematics National Examination for Bengkulu City Junior High School students in 2018 experienced a decrease in the ranking of the average National Exam scores in Bengkulu Province. The highest average national mathematics examination results in 2018 were obtained by Central Bengkulu regency with an average mathematical score of SMP 4 Bengkulu Tengah which was 67.86 while SMPN 1 Bengkulu City won the highest UN score in Bengkulu City only achieved the average mathematics UN score of 67.53. Based on these results, Bengkulu City Junior High School finds second place after Central Bengkulu Regency. The fact of the decline in the average value of the Junior High School National Examination in

Bengkulu City in 2018 was revealed by the Head of Bengkulu Province Education and Culture Office Budiman (Bengkulu Ekspres. 2018) stating that there were three factors that caused the UN score to fall, namely the quality of Human Resources in this case the teacher, the quality of learning namely how to teach teachers is not yet standard and third is the lack of facilities and infrastructure. The quality component of learning is related to students' abilities [2], namely communication skills and understanding of mathematical concepts.

The fact of the decline in the average value of mathematics in the city of Bengkulu, one of which is caused by the low mastery of mathematics by students. Students often feel disappointed when making a mistake in a mathematical calculation which then has an implication for the low delivery of messages or news in students' mathematical understanding. The low state of communication skills causes students not to be encouraged to solve problems in first exploring the mathematical communication that students understand so that it has implications for the lack of students' ability to understand mathematical concepts in solving mathematical problems.

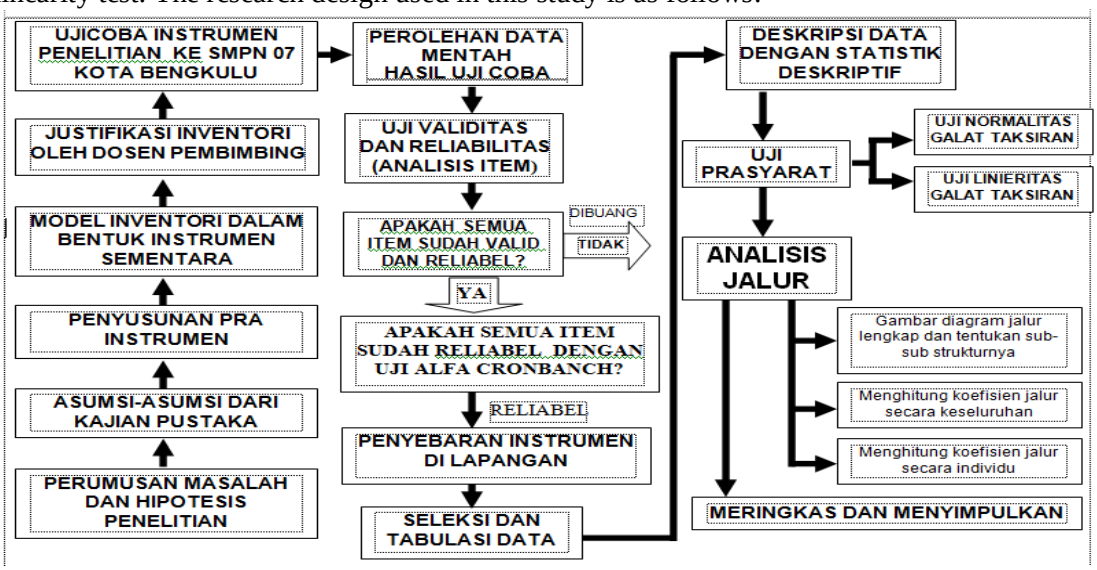
Baroody defines Communication is a way to share ideas and clarify understanding [3]. Understanding Communication is also strengthened by Hajj [4] explains that in communication contains three components, namely the contents of the message / news, the process of sending / receiving messages, and people who send / receive messages. Based on Eviana et al's research results obtained by r count the correlation between communication skills and mathematical conceptual understanding is 0.0320 greater than r table 0.304 with a significant level of 5% and db = 40, then the alternative hypothesis (H) is accepted with the meaning of mathematical communication skills and mathematical conceptual understanding there is a significant positive correlation in class VII SMP Negeri 14 Pontianak [5]. These results are similar by Nur Afiani The calculation results show the value of ttable> tcount is 3.05> 2.02 and the value of r = 0.32 and the magnitude of the contribution of mathematical communication skills (X_1) to mathematics learning achievement (Y) is 10.6 It can be concluded that there is a significant influence of mathematical communication skills on mathematics learning achievement [6]. The ability of mathematical communication is defined as an essential part of mathematics learning to help students build the meaning of learning material and stick to students so that students are able to share with others both in writing or verbally, students learn to be able to explain and convince what they understand [7]. Broadly speaking, it was concluded that 70% of the characteristics of mathematical communication skills related to the level of understanding of students in conveying a message, news in the form of diagrams or tables [8]. Someone is said to understand if the person understands correctly and is able to explain something that is understood. Hajj, Saleh added that concepts are abstract ideas that can classify or classify a group of objects, whether certain objects are examples of concepts or not. Examples of concepts include: right triangle, parallelogram, circle, semigroup, real number, and complex number [9]. Based on Izwanto's research results obtained self-efficacy ($\gamma_{11} = 0{,}965$) on the ability to understand concepts with 120 respondents and t_{count} = 39,741 and t_{table}= 1,980contributed greatly to the ability to understand mathematical concepts [10].

The results of the study above indicate that the ability of mathematical communication directly affects the ability to understand mathematical concepts. The focus and attention of this research has traced the influence of intervariable causality, namely the direct influence between communication skills on the ability to understand concepts.

2. RESEARCH METHODS

This type of research includes the type of descriptive and verification research, because it is used to explore the effect of causality between variables. Data collection used survey research methods with a quantitative approach. The population is all Bengkulu City Public Middle School students registered in the 2018/2019 school year totaling 5443 [11]. Sampling

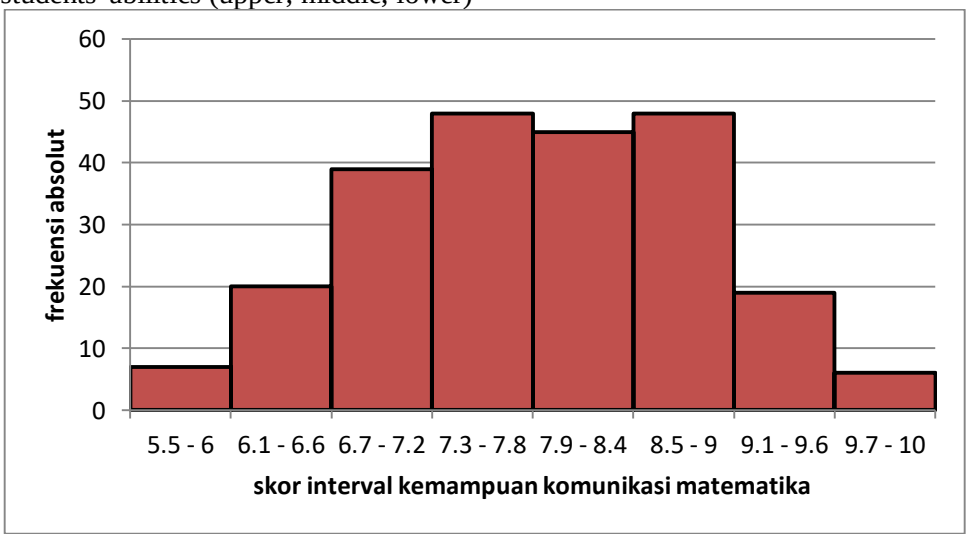
was done by proportional stratified random sampling technique with a sample size of 232 in class IX. Data were analyzed using path analysis technique, which was previously tested by analysis requirements in the form of an estimated error normality test and an estimated error linearity test. The research design used in this study is as follows:



Picture 1. Research Design

3. RESEARCH RESULTS AND DISCUSSION

Data of communication ability variable with mean 7,85599; std. Error of Mean 0.06403; Median 7.9000; Mode 8.50; Std. Deviation 0.97527; Variance 0.951; Range 4.50; Minimum 5.50; Maximum 10.00; and Sum 1823.50. Variable data capability for understanding concepts with a mean of 7.7080; std. Error of Mean 0.06722; Median 7.7500; 7.50 Mode; Std. Deviation 1.02386; Variance 1.048; Range 4.50; Minimum 5.50; Maximum 10.00; and Sum 1788.25. The acquisition of mathematical concept understanding tests and mathematical communication can be seen from the following presentations which are reviewed based on the level of students' abilities (upper, middle, lower)

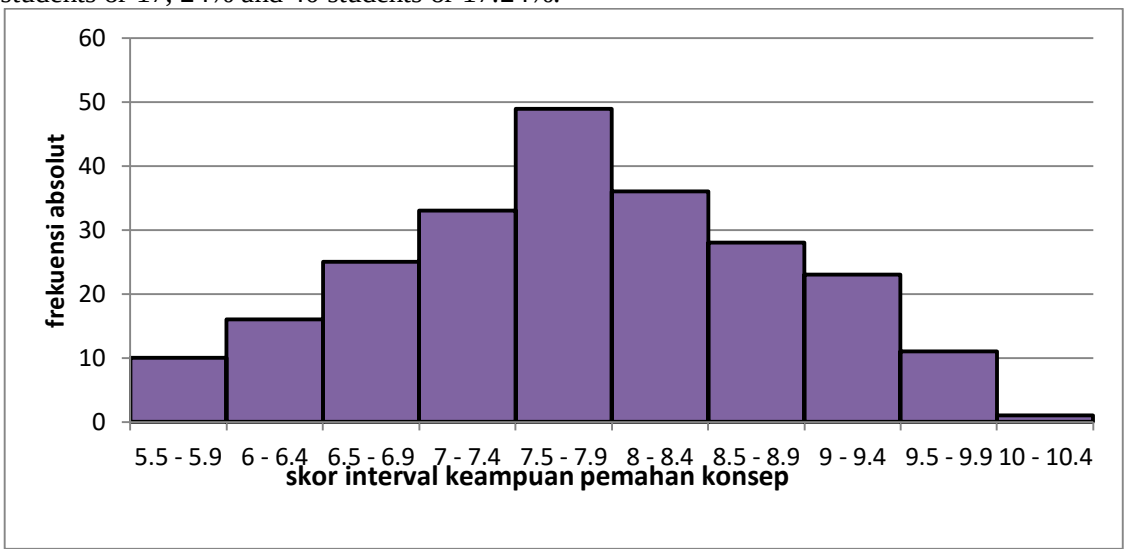


Picture 2. Distribution of Mathematical Communication Score Data

Table1. Classification of Communication Scores for Bengkulu City Middle School Students (X_3)

Category	Interval	Amount	Persentase
Low	< 6.88	40	17.24
Middle	6.88 s.d 8.84	152	65.52
high	> 8.84	40	17.24
	amount	232	100.00

Based on Table 4.7 above, we can see that the dominant mathematics communication ability scores of Bengkulu City Junior High School students are in the medium category, amounting to 152 students or 65.52%, while for the low and high categories respectively 40 students or 17, 24% and 40 students or 17.24%.



Picture 3. concept understanding score data distribution

Table 2. Classification of Understanding Scores of Bengkulu City Junior High School Concept (Y)

Category	Interval	amount	Persentase
Rendah	< 6.68	36	15.52
Sedang	6.68 s.d 8.73	148	63.79
Tinggi	> 8.73	48	20.69
	amount	232	100.00

Based on Table 2 above, we can see that the dominant ability understanding concept scores of Bengkulu City Junior High School are in the medium category, amounting to 148 people or 63.79%, while for the low and high categories respectively 36 students or 15 , 52% and 48 students or 20.69%.

Model Testing and Hypotheses

Testing the substructure hypothesis with structural equation $X_3 = \beta yx_3 + \varepsilon_1$ has the following statistical hypothesis:

H_0 :$\beta yx_3 = 0$: Concept Understanding Ability (Y) does not have a direct positive effect on mathematical communication skills (X_3)

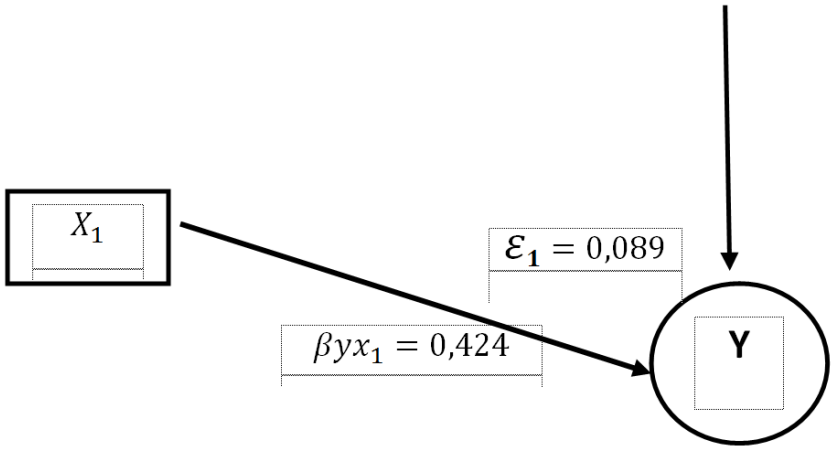
H_1: $\beta yx_3 \neq 0$: Concept Understanding Ability (Y) has a direct positive effect on mathematical communication skills (X_3)

Table 3. Summary of Pathway Coefficient Results (X_3) above (Y) Substructure

influence between variables	**Path coefficient Gamma**	**T value calculated**	**Sig.**	**F value calculated**	**Test result**	**Coefficient of Determination R2**	**Other variable coefficients (residual)**
X_3 terhadap Y	0,224	1,632	0,001	9748,629	H_0 ditolak	0,992	0,0079

The calculation results obtained value F_calculate = 9748,629 with a probability value (sig.) = 0,000. Because [(sig.) = 0.001.] <[$\alpha = 0{,}05$], then the decision is H_0 is rejected and H_1 is accepted as Mathematical Communication Ability (sig.) (X_3) positif direct effect on the ability to understand mathematical concepts (Y). $\beta_{yx1}X_1 = 0{,}424$ with a value of $t_{count} = 3{,}344$ and sig. = 0.001, path coefficient (X_2) to (Y) or $\beta_{yx2}X_2 = 0{,}349$ with a value of $t_{count} = 5{,}779$ and sig. = 0.000, path coefficient (X_3) against (Y) or $\beta_{yx2}X_2 = 0{,}349$ with a value of $t_{count} = 5{,}779$ and sig. = 0.000, path coefficient (X_3) to (Y) or $\beta_{yx2}X_3 = 0{,}224$with the value of t_{count} = 1,632 and sig = 0,104. All residual coefficients (ε_1) are calculated based on the Model Summary output model, namely:

$$\varepsilon_1 = \sqrt{1 - R^2_{(Y)(X_1,X_2,X_3)}} = \sqrt{1 - 0{,}992} = 0{,}089.$$



Picture 4. research design

4. Conclusion

The conclusion of this research is the ability of mathematics communication to have a direct positive effect on the ability to understand mathematical concepts by the value of alpha $\beta_{yx2}X_3 = 0{,}224$

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