SELF-EFFICACY AND SELF-ESTEEM AGAINST MATHEMATICAL COMMUNICATION ABILITY

La Ode Sirad [1*], Farman [2], Samsiah [3]

[1,2,3] Mathematics Education Study Program, Universitas Sembilanbelas November Kolaka
Pemuda Street, No. 339, Kolaka District, 93517, Sulawesi Tenggara Province, Indonesia

e-mail: [1] laodesirad.usnkolaka@gmail.com

Abstract

An important aspect that students must possess is good self-efficacy and self-esteem. Several indicators that support achieving these goals are found in self-efficacy and self-esteem to gain students' mathematical communication. The main objective of this research is to determine whether the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah can be jointly affected by self-efficacy and self-esteem. This research is ex post facto research with a quantitative approach. The population in this study were all class VIII SMP Negeri 4 Buton Tengah, with a total of 149 students with a total sample of 30 students obtained using the proportional random sampling technique—data collection techniques using questionnaires and tests. Data analysis used inferential analysis using F-test and t-test. The results of this study are as follows : (1) The mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah is significantly affected by self-efficacy and self-esteem with $F_{count} = 5,625 < 3,34 = F_{tab}$; (2) Mathematical communication ability are not significantly affected by self-efficacy with $t_{count} = 0,296 > 2,052 = t_{tab}$; (3) Mathematical communication ability is significantly affected by self-esteem with $t_{count} = 31,82 < 2,052 = t_{tab}$.

Keywords: mathematical communication ability, self-efficacy, self-esteem

1. Introduction

Advances in technology have an impact on various aspects of human life, especially education in the world, including Indonesia. The impact of technology is implemented with the presence of modern learning in schools.

In learning mathematics students are required to be able to play an active role and be able to communicate ideas in solving a given problem. There are two reasons that make communication very important in learning mathematics which must always be developed in students (Nasution, 2013). First, mathematics as language, meaning that mathematics is not just a thinking tool, a tool for finding patterns, solving problems or drawing conclusions, but mathematics is also 'an invaluable tool for communicating a variety of ideas clearly, precisely, and succintly' (Nada et al., 2022). Second, mathematics learning as social activity, meaning that mathematics and learning mathematics are at the heart of human social activities, for example in learning mathematics as a vehicle for interaction between students and also communication between teachers and students (Aminah et al., 2018). Students who have communication ability will understand the mathematical concepts they learn.

Mathematical communication ability is the ability of students to reflect pictures, graphs, diagrams, tables into mathematical ideas and convey them using their own language, and can express everyday events in mathematical language or symbols (Rachmadini et al., 2018). According to (Herdiana et al., 2017) students want to understand mathematics learning in depth, good communication is needed both orally and in writing. Ways of communication that are often used in mathematics using graphs, charts, diagrams, symbols, symbols and equations. Using communication methods such as tables, diagrams and graphs can lead students to make new conclusions, predictions and questions. Mathematical communication ability include the ability to state a problem in mathematical language, symbols, ideas, and mathematical models. Shiva can explain and read meaningfully, express, understand, interpret, and evaluate a mathematical idea and study of mathematics orally, in writing, or visually. In addition, students must also be able to listen, discuss, and write about mathematics; and state an argument in your own language Sumarmo in (Hendriana et al., 2013).

According to Wardhani, (2021), one of the important abilities in the Program for International Student Assessment (PISA) mathematical literacy assessment is communication. The results of the 2018 PISA show that Indonesia is in the bottom 10 of the 79 participating countries, with a score of 352 for Indonesian students' mathematical abilities, which means that it is still below the achievements of students in ASEAN countries (Pusat Penelitian Kebijakan, 2021). The results of the TIMSS (T*rends in International Mathematics and Science Study*) survey show that students' mathematical communication abilities in Indonesian students' mathematics learning are still below the international average. TIMSS survey results in 2011 and 2015 with an average score of 386 and 397 put Indonesia at a low level (Hadi & Novaliyosi, 2019). The low ability of students to communicate mathematical concepts in learning mathematics is one of the causes of the low ability of mathematical communication (Nufus, 2017).

The results of an interview conducted with one of the Mathematics teachers at SMP Negeri 4 Buton Tengah class VIII in the odd semester of the 2021/2022 Academic Year stated that there were still many students who viewed mathematics as a difficult subject. The observation results showed that the average score of students' mathematics was relatively low, as seen from the data on the results of the midterm tests for class VIII students of SMP Negeri 4 Buton Tengah in the mathematics subject, which showed that 60% of the students' test results were unsatisfactory. When given assignments or tests, the majority of students tend to imitate the work of their friends rather than do it themselves, one of the reasons is because they are afraid of being wrong. There are also those who are proud to imitate but instead carry out tasks carelessly that are important to complete. Another fact was found that when students were given homework, often some students could not complete the task. The reason is because students do not understand the material being taught and lack enthusiasm to review the material.

Students are less able to communicate mathematical ideas because there is no confidence in students regarding the abilities that students have, this ability is included in the affective domain, namely self-efficacy (Sariningsih, R., & Purwaningsih , R., 2017). Self-efficacy is a person's belief in his ability to mobilize motivation, cognitive resources, and

actions needed to overcome certain situations. Self-efficacy is a person's ability to communicate ideas has an influence on mathematics learning achievement (Muklis & Sanhadi, 2016). In dealing with individual life problems, self-efficacy plays an important role Hashemi in (Julita et al., 2019). Another affective aspect that affects students' communication ability is self-assessment (Aspriyani, 2020).

A person's general assessment of himself either in the form of negative or positive judgments which ultimately results in a feeling of self-worth or usefulness in living life is called self-esteem. Self-esteem is an individual's assessment of his own ability, success, usefulness and worth (Pujiastuti, 2017). Self-esteem is an attitude, an evaluative component of oneself and also an effective assessment of self-concept based on acceptance. Self-esteem is an attitude, evaluative component of oneself and also an effective assessment of self-concept based on self-acceptance and feelings of worth which then develop and are processed as a consequence of awareness of abilities and reciprocity from outsiders, Guindon in (Setyarini & Atamimi, 2011).

Based on the description above, the writer is interested in identifying the Effect of Self-Efficacy and Self-Esteem on Mathematical Communication Ability in Students of SMP Negeri 4 Buton Tengah.

2. Method

The research is an ex-post facto with a quantitative approach which aims to find out about the mathematical communication abilities of SMP Negeri 4 Buton Tengah students which can be affected by self-efficacy and self-esteem. The population in this study were all class VIII students of SMP Negeri 4 Buton Tengah, which consisted of 5 classes in the odd semester of the 2020/2021 academic year, with a total of 149 students. By using the formula $n = N \times 20\%$ obtained a sample of 30 students. Using a proportional random sampling technique, which is a research technique by determining the sample by taking representatives from each group in the population that are randomly selected for each class.

Data collection techniques in this study using questionnaires and tests. The instrument used was a self-efficacy and self-esteem questionnaire. Self-efficacy questionnaires are used to measure indicators which include the level of difficulty, the level of strength and generality. Self-esteem questionnaire for aspects that include strength, significance, virtue and competence. While the test instrument is used to measure indicators of mathematical communication ability which include connecting real objects, pictures and diagrams to mathematical ideas, explaining ideas, situations and mathematical relations orally or in writing, with real objects, pictures, graphs, algebra and stating daily events in language or mathematical symbols.

Data analysis techniques used in this study are descriptive analysis techniques and inferential analysis. Descriptive analysis is used to describe the ability level of self-efficacy and self-esteem and mathematical communication ability, with the steps: a) convert scores into values $0 - 100$, b) tabulate score data, and c) calculate student grades. Furthermore, it is categorized into very high, high, medium, low and very low. Inferential analysis begins with analysis prerequisite test with random error assumption test has a mean of 0, heteroscedasticity test, random error assumption test is not correlated, and random error assumption test is normally distributed. Hypothesis testing was analyzed by simultaneous test, namely F-test and partial test by t-test.

3. Results and Discussion

3.1 Results

Based on the results of the descriptive analysis of the variables self-efficacy, self-esteem and mathematical communication abilities of class VIII students of SMP Negeri 4 Buton Tengah can be seen in the following table:

Table 1. Analysis of Descriptive Results

Statistics		Statistical Value
Self Efficasy	Max score	96,08
	Min score	9,8
	Mean	58,3
	SD	14,9
Self Esteem	Max score	81,25
	Min score	47,92
	Mean	59,79
	SD	9,11
Mathematical Communication Ability	Max score	83
	Min score	42
	Mean	62,37
	SD	9,04

Based on table 1, it is found that for self-efficacy with a maximum score is 96,08 and a minimum score is 9,80, the mean is 58,30, and the standard deviation is 14,90. For self-esteem with the maximum score is 81,25, minimum score is 47,92, mean is 59,79 and standard deviation is 9,11. Mathematical communication ability have a maximum score is 83, a minimum score is 42, a mean is 62,37 and a standard deviation is 9,04. Based on the reference for giving categories of self-efficacy, self-esteem and communication ability, the categories can be seen in tables 2, 3 and 4.

Table 2. Student Self Efficacy Categories

Category	Score	F	%
Very high	$80,65 \leq X_i$	1	3,33%
High	$65,75 \leq X_i < 80,65$	6	20,00%
Medium	$50,85 \leq X_i < 65,75$	20	66,67%
Low	$35,95 \leq X_i < 50,85$	1	3,33%
Very low	$X_i < 35,95$	2	6,67%
Total		**30**	**100%**

Based on table 2, self-efficacy belonging to the very high category was 1 person or 3,33%, the high category was 6 people or 20,00%, the moderate category was 20 people or 66,67%, the low category was 1 person or 3,33% and the category very low amounted to 1 person or 6,67%.

Table 3. Student Self Esteem Category

Category	Score	F	%
Very high	$73,46 \leq X_i$	3	10%
High	$64,35 \leq X_i < 73,46$	6	20%
Medium	$55,25 \leq X_i < 64,35$	12	40%
Low	$46,12 \leq X_i < 55,25$	9	30%
Total		**30**	**100%**

Based on table 3, self esteem belonging to the very high category is 3 people or 10%, the high category is 6 people or 20%, the moderate category is 12 people or 40%, and the low category is 9 people or 30%.

Table 4. Categories of Mathematical Communication Ability

Category	Score	F	%
Very high	$\overline{X} > 75,92$	1	3,3%
High	$66,89 < \overline{X} \leq 75,92$	8	26,7%
Medium	$57,85 < \overline{X} \leq 66,89$	14	46,7%
Low	$44,81 < \overline{X} \leq 7,85$	6	20%
Very Low	$\overline{X} \leq 44,81$	1	3,3%
Total		**30**	**100%**

Based on table 4, mathematical communication ability students who belong to the very high category are 1 person or 3.3%, the high category is 8 people or 26.7%, the medium category is 14 people or 46.7%, the low category is 6 people or 20%, and the very category low amounted to 1 person or 3.3%.

Before carrying out the hypothesis test, a prerequisite test was carried out which included a random fierce test having a mean of 0, assumptions of uncorrelated random drives, normality test, linearity test and heteroscedasticity which can be seen in tables 5, 6, 7, 8 and figure 1.

Table 5. Random Fierce Has a Mean of 0

	Mean	N
Residual	0,00	30

Table 6. Uncorrelated Random Fierce Assumptions

d_{count}	d_{table}		Conclusion
	dU	dL	
2,59	1,57	1,28	Uncorrelation

Table 7. Normality Test Results

L_0	L_{table}	Conclusion
0,15	0,16	Normal Distribution

Table 8. Linearity Test Results

F_{count}	F_{table}	Conclusion
2,34	3,34	Relationship X_1 and X_2 against Y Linear

Based on tables 5, 6, 7 and 8 it is found that the residual value has a mean $= 0.00$, the autocorrelation test obtained the value of the Durbin Watson statistic $d \geq dU$ which means there is no correlation, the normal distribution error assumption test obtained the value $L_0 = 0,15 < 0,16 = L_{table}$ which means that the random error is normally distributed, and the results of the linearity test with $F_{hitung} = 2,34 < F_{tabel} = 3,34$ which means it has a linear relationship. The results of the heteroscedasticity test can be seen in the Scatterplot which can be seen in the following figure.
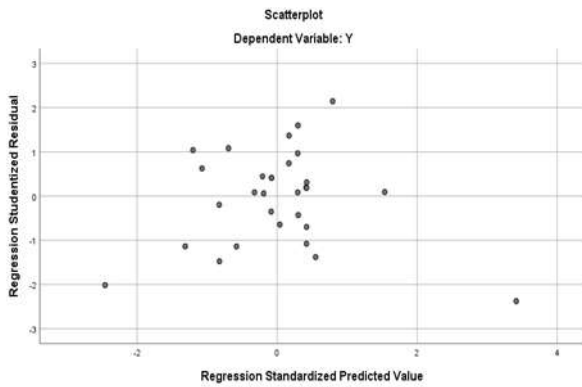
Figure 1. Scaterplot

Based on Figure 1, it is obtained that: 1) the data points spread above and below, and are around zero, 2) the spread of the dots does not form a pattern such as gathering in the middle, narrowing then widening, or widening then narrowing. So it was found that there were no symptoms of heteroscedasticity in the regression model.

The results of the simultaneous analysis test with the F-test to see that mathematical communication ability are simultaneously affected by self-efficacy and self-esteem are presented in the form of the following ANOVA table :

Table 9. Analysis of Variance (ANAVA) Significance Test

Source of Variance	Free Degreess	Squared Sum	Average Sum of Squares	F_{Count}
Regresi (β)	3	118810,3		
Regresi (β_0)	1	11248,63		
Regresi ($\beta_1, \beta_2 \mid \beta_0$)	2	107808,37	281,233	5,652
Residu	27	246,7	49,756	
Total	30	11957		

Based on table 9, $F_{count} = 5,625 > F_{tab} = 3,34$ which means that the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah are significantly affected by self-efficacy and self-esteem. The percentage effect of self-efficacy and self-esteem simultaneously on mathematical communication ability can be seen in table 10 below.

Table 10. Analysis of the Determination Coefficient

JK_{res}	JK_{yy}	R^2
246,7	1108,64	0,777

Based on table 10, the coefficient of determination $R^2 = 0,777$. This shows that the percentage of mathematical communication skills is affected by the variables of self-efficacy and self-esteem simultaneously by 77.7%.

Table 11. Correlation Analysis for X_1 and Y

R	KD	t_{count}
0,16	2,56%	0,838

In the tabel 11, $t_{count} = 0,838 < 2,052 = t_{tab}$ which means that the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah are not significantly affected by self-efficacy.

Table 12. Correlation Analysis for X_2 and Y

R	KD	t_{count}
0,98	96,04%	26,78

In the table 12, $t_{count} = 26,78 > 2,052 = t_{tab}$ which means that the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah are significantly affected by self-esteem

3.2 Discussion

Through the F-Test obtained $F_{count} = 5,625$ and $F_{table} = 3,34$ which means that simultaneously students mathematical communication ability are significantly affected by students' self-efficacy and self-esteem. That is, if students' self-efficacy and self-esteem have increased, students mathematical communication abilities will also have increased, and vice versa. This is in line with what was stated (Azhari et al., 2018) success in learning mathematics is influenced by affective aspects or attitudes, which include self-efficacy and self-esteem. This is reinforced by (Maspe & Dassa, 2021) stated that simultaneously students mathematical communication abilities were affected by self-efficacy and self-esteem. The higher the students self-efficacy and self-esteem, the higher the

students mathematical communication ability, and vice versa. Self-efficacy is the ability that a person has to communicate ideas and one's perception of the abilities he has. Accrding to Hamidah (2010) the higher a person's self-efficacy for the ability to formulate concepts, convey ideas, and sharpen ideas to convince others, the higher his mathematical communication ability. Smith and Betz in (Aspriyani, 2020) stated that having self-esteem is very important as an assessment of himself so that he continues to respect the values that exist in him. So that another factor that affects students' mathematical communication ability is self-esteem. Self-esteem is a psychological aspect that contributes well to student success in the academic domain.

Mathematical communication ability which is affected by self-efficacy and self-esteem together is 0.777. This shows that the contribution of self-efficacy and self-esteem together is 77,7%. Partially using the t-test, it is obtained $t_{count} = 0,838$ dan $t_{table} = 2,052$ so that $t_{count} = 0,838 < 2,052 = t_{table}$ which means which means that the mathematical communication ability of class VIII students of SMP Negeri 4 Tengah Buton are not significantly affected by students' self-efficacy. Based on this, students' mathematical communication abilities cannot always be predicted through self-efficacy. So that it can be said that the level of students' self-efficacy does not affect the level of students' mathematical communication abilities. The research results are different from those conducted by (Hendriana & Kadarisma, 2019) that students' mathematical communication ability have a positive effect on self-efficacy, with a closeness level of 0,776 belonging to a strong positive interpretation and a correlation coefficient of 60,2%. Based on this, the level of students' mathematical communication ability can be predicted by the level of self-efficacy.

Based on the observation results that some students do not have a good enough effort in understanding the material when studying mathematics, and easily give up in completing assignments given by the teacher. This shows that students' self-efficacy towards mathematics in the efforts made by students in learning mathematics is still low. This is supported by Viktoriana's opinion in (Nurhanurawati et al., 2021) the characteristics of students who have low self-efficacy, students will give up too quickly when experiencing obstacles and students easily relax their efforts. This is what

distinguishes the results of this study from previous studies.

Partially using the t-test, it is obtained $t_{count} = 26,78$ dan $t_{table} = 2,052$ so that $t_{count} = 26,78 > 2,052 = t_{table}$ which means that the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah is significantly affected by self-esteem. With a coefficient of determination of 0,98, which means there is a significant positive correlation between students' mathematical communication ability and self-esteem. The existence of a positive correlation indicates that the higher the student's self-esteem, the higher the student's mathematical communication ability. Conversely, if the self-esteem is low, the mathematical communication ability will also be lower. This is in line with (Aspriyani, 2020) that there is a positive correlation between students' mathematical communication ability and student self-esteem. Students with high self-esteem will be able to generate confidence in themselves so that they have the ability to learn. Fulfillment of self-esteem is very important for every student, because this will have a negative impact if students do not have strong self-esteem. Students will have difficulty dealing with behavior and even tend to have low self-esteem with the abilities they have (Julia, 2021). Therefore, in order for students' mathematical communication abiities to continue to improve, they must have good self-esteem.

4. Conclusion

Descriptively, the average self-efficacy of Grade VIII students at SMP Negeri 4 Buton Tengah is in the moderate category, with a total of 18 students or 60% of the research sample. The average self-esteem of class VIII students at SMP Negeri 4 Buton Tengah is in the moderate category, with a total of 17 students or 56.7%. And the average mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah is in the medium category, with a total of 14 students or 46.7%.

Simultaneously the mathematical communication abilities of class VIII students of SMP Negeri 4 Buton Tengah are significantly affected by self-efficacy and self-esteem. Partially, the mathematical communication ability of class VIII students of SMP Negeri 4 Buton Tengah is not significantly affected by self-efficacy but is significantly affected by self-esteem.

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