

## The Effect of Self-Esteem on Students' Mathematical Communication Skills

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### Abstract

This study aims to find out between students with high, medium, and low self-esteem in term of better mathematical communication. This type of research is quantitative research. The data analysis technique used was one-way variance analysis with inequivalent cells. The collection of students' mathematical communication data was obtained from the score of mathematical communication tests, and the data of self-esteem was collected through questionnaires. The subjects of this study were the eighth-grade junior high school students in Ponorogo with the high, medium and low schools categories. The results of this study indicate that students with high self-esteem possess better mathematical communication skills compared to students with moderate self-esteem and students with low self-esteem. Students with low self-esteem are having the same level of mathematical communication skills as students with moderate self-esteem.

**Keywords:** Mathematical Communication; Self-esteem.

### INTRODUCTION

Mathematics can be used as one of the symbolic languages that allow the realization of communication accurately and precisely. On the other hand, mathematics learning is difficult to be communicated because it is hindered by abstract symbols (Supriadi, 2015). Therefore, the ability to understand a mathematical problem and then changes it into mathematical symbols is an ability needed in mathematics or what is called mathematical communication (Zahara, 2014). Mathematical communication is a tool in the transmission of mathematical knowledge or as a foundation in building mathematical knowledge (Maulani, Suyono, & Noornia, 2017; Vahlia & Sudarman, 2015) expressing mathematics in the form of mathematical models and images, and writing answers using their own words. This makes mathematical communication skills is very important to be improved. Although in fact, students' mathematical communication skills in expressing ideas in the form of data presentation into tables and diagrams are still low. (Adesty, Nurhanurawati, & Widyastuti, 2014).

Regarding the students' low mathematical communication skills, in addition to the cognitive aspects, the effective aspects that can affect the low level of mathematical communication are self-esteem. Self-esteem is an individual's assessment of his own ability, success, usefulness, and kindness (Happy & Widjajanti, 2014).

Self-esteem has a relationship with a number of life factors including the success of students at school. Students who have high self-esteem can solve their problems independently. The students who have a negative attitude towards mathematics is students who have low self-esteem. This implies that low self-esteem has a detrimental effect on students' achievement, thus, it is necessary to do research on the influence of self-esteem in learning.

There have been several studies discussed the self-esteem (Bruce, 2016; Happy & Widjajanti, 2014; Kaplanova, 2019; Lumongga, 2012; Rizkianto, Muflikhaki, & Hernawati, 2013) and several studies in an effort to improve students' mathematical communication skills (Ambarwati, Dwijanto, & Hendikawati, 2015; Andrianti, Irawati, & Sudin, 2016; Choridah,

2013; Hapizah, 2015; Hartati & Suyitno, 2015; Mahmud & Hartono, 2014; Maulani et al., 2017; Nurhayati, 2018; Nuriadin, 2015; Permata, Kartono, & Sunarmi, 2015; Putra, 2016; Supriadi, 2015; Supriadi & Damayanti, 2016). However, there has been no previous research that examined students' self-esteem towards their mathematical communication skills. Based on the research that has been done before, the renewal in this study lies in seeing the effect of self-esteem on students' mathematical communication skills. So, the purpose of this study is to find out which one provides better mathematical communication skills between students with high, medium, and low self-esteem

### THE RESEARCH METHODS

The type of this research is quantitative. The population in this study were students of the Junior High Schools (SMP) in Ponorogo District, East Java Province, Indonesia. The subjects of this study were Junior High Schools students of the eighth grade from three schools in Ponorogo. The three schools were categorized based on PAMER of 2017 by using stratified cluster random sampling. Each school represents three categories, namely high, medium, and low. Based on the results of the categorization, the school with high category was the SMPN 2 Ponorogo, the school with medium category was SMPN 5 Ponorogo, and the school with low category was SMPN 2 Babadan. The subjects in this study were 249 students which then divided into 3 groups with the following detail: 96 students from the school with a high category, 85 students from the school with medium category, and 68 students from the school with the low category.

Data collection techniques employed in this study were tests and questionnaires. The research instrument consisted of tests of mathematical communication skills and questionnaires of self-esteem. The try-out of the mathematical communication skills test instruments and questionnaires of self-esteem was conducted on 56 students. The mathematical communication test instruments referred to the content validation criteria, item discrimination ( $D \geq 0,3$ ), level of difficulty ( $0,3 \leq P \leq 0,7$ ), and reliability ( $r_{11} \geq 0,7$ ). From 5 tried-out items, there were only 3 items used as tools for collecting data on students' mathematical communication skills. The try-out of the questionnaires of self-esteem referred to the validation criteria of content, internal consistency ( $D \geq 0,3$ ), and reliability ( $r_{11} \geq 0,7$ ). From 40 tried-out items, only 35 items used as a tool to obtain the data on self-esteem. Furthermore, the data analysis technique in this study was one-way variance analysis with inequivalent cell.

### THE RESULTS OF THE RESEARCH AND THE DISCUSSION

This study was begun by determining the research subjects. The population of this study was all State Junior High School (SMP) students in Ponorogo district which consisted of 54 schools. The subject of this study was the eighth-grade students from three schools in Ponorogo district. Three categories of schools were obtained based on the analysis of the national exam in 2017. The results of the analysis of the categorization of the schools can be seen in Table 1.

**Table 1. Results of Schools Categorization**

School Category	Name of the School
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High	SMPN 2 Ponorogo
Medium	SMP Negeri 5 Ponorogo
Low	SMP Negeri 2 Babadan

Based on Table 1, the three schools were categorized as high, medium and low categories. The schools with high category were SMP Negeri 2 Ponorogo, the school with medium category was SMP Negeri 5 Ponorogo and the school with low category was SMP Negeri 2 Babadan. The subjects in this study were 249 students where 96 students were taken from the school with high category, 85 students were taken from medium category school, and 68 students were taken from low category school.

In this study, students' mathematical communication data collection techniques used were the test method in the form of description questions that had been validated by experts which then tested to the students in the three schools. Mathematical communication data was used to determine the number of students in three categories, namely high, medium, and low categories. Here are the results of the analysis of students' mathematical communication.

**Table 2. Distribution of Students' Mathematical Communication Skills**

Self-esteem Category	Schools Category			Number of Students
	High	Medium	Low	
High	42	28	29	99
Medium	34	32	28	94
Low	20	25	11	56
Number of Students	96	85	68	249

Based in Table 2, 99 students possessed high mathematical communication skills, 94 students possessed medium mathematical communication skills, 56 students possessed low mathematical communication skills. From the results of this analysis, it can be seen that the students' mathematical communication in the medium category is higher than the high and low categories, although, in terms of numbers, the difference was not too significant. This can be interpreted that the results of students' mathematical communication skills were not satisfying.

Furthermore, the questionnaire method was used to take the self-esteem date. The questionnaire instrument was been validated by experts and then answered by the research subjects. The questionnaire of self-esteem was used to determine the number of students with high, medium, and low self-esteem categories in each school. Here are the results of the questionnaire analysis students' self-esteem.

**Table 3. The Distribution of Self-esteem**

Self-Esteem Category	Schools Category			Number of Students
	High	Medium	Low	

High	28	32	21	81
Medium	44	33	31	108
Low	24	20	16	60
Number of Students	96	85	68	249

Based on Table 3, there were 81 students with high self-esteem, 108 students with medium self-esteem, and 60 students low self-esteem. From the analysis, the students with medium self-esteem were higher in number than the students with high and low self-esteem. The number of students in each category was not too significantly different. In addition, based on table 3, it can also be interpreted that students with high self-esteem were lesser in number than the overall student's self-esteem. This means that there were still many students who negatively assessed themselves which then contributed to their low mathematical communication skills. Furthermore, the results of the categorization analysis of the students' mathematical communication skills and students' self-esteem can be seen in Table 4.

**Table 4. The Categorization of the Students' Mathematical Communication Skills and Self-Esteem**

Mathematical Communication Category	Self-Esteem Category			Number of Students
	High	Medium	Low	
High	38	31	18	87
Medium	23	40	19	82
Low	24	35	21	80
Number of Students	85	106	58	249

Based on Table 4, the high mathematical communication skills were more dominantly owned by students with high self-esteem category. Students with high self-esteem category possessed a positive personality, willing to strive, always eager to do the work and not easy to succumb to failure, capable of resolving the problems in the mathematics learning, thus affecting the results of mathematical communication skills. The medium mathematical communication skills were more dominantly owned by students with medium self-esteem category characterized by their low fondness toward challenges so that in learning, they lack confidence in their own abilities. The low mathematical communication skills were more dominantly owned by students with low self-esteem category. Students with low self-esteem category tended to have negative personality traits, lack of confidence, lack of motivation to do tasks well, unable to stimulate themselves, thus, affecting their mathematical communication skill.

To find out which one provides better mathematical communication skills between students with high, medium, and low self-esteem, this study employed one-way variance analysis with inequivalent cells because the size of the samples at each school was not the same. The data from the analysis to be used in the one-way ANAVA with inequivalence cells statistical test can be seen in Table 5.

**Table 5. The Description of Students' Self-Esteem**

Self-esteem Category	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
High	86	50.19	14.126	1.523	22	73
Medium	105	44.13	15.204	1.484	9	76
Low	58	40.34	15.604	2.049	9	65
Total	249	45.34	15.359	973	9	76

Based on Table 5, the data to be used for statistical tests was obtained. After the students' mathematical communication skills and self-esteem had been categorized into high, medium, and low, one-way ANOVA with inequivalent cells was carried out. The question is whether the three categories of self-esteem gave the same effect on students' mathematical communication skills (as  $H_0$ ), or at least there are two categories that do not have the same effect on students' mathematical communication (as  $H_1$ ). The results of the statistical tests can be seen in Table 6.

**Table 6. The Summary of the Variance Analysis**

	Sum of Squares	Df	Mean Square	$F_{obs}$	P
Between Groups	3619,724	2	1809,862	8.113	.000
Within Groups	54880.260	246	223.090	-	-
Total	58499.984	248		-	-

Based on Tables 6, it appears that the  $F_{obs} = 8.113$  and  $p < 0.05$ ,  $H_0$  is rejected. In conclusion, it is not true that the three categories of self-esteem equally affect the students' mathematical communication skills. Furthermore, a test with the Scheffe method was carried out to find out which ones provide better mathematical communication between students with high, medium, or low self-esteem. The result of the test is presented in Table 7.

**Table 7. Multiple Comparisons with Scheffe Method**

	(I) Self-esteem	(J) Self-esteem	Mean Difference (I-J)	P
Scheffe	High	Medium	6053*	.022
		Low	9841*	.001
	Medium	High	-6053*	.022
		Low	3789	.302
	Low	High	-9841*	.001
		Medium	-3789	.302

Based on Table 7, it is known that the comparison of mathematical communication skills between students with high and medium self-esteems is  $p(\text{sig}) = .022 < 0.05$ , then  $H_0$  is rejected. This means that students with high self-esteem do not have the same mathematical communication as students with medium self-esteem. By looking at the mean, it can be

concluded that students with high self-esteem have better mathematical communication skills than students with medium self-esteem. Comparison of mathematical communication between students with low and high self-high is  $p(\text{sig}) = .001 < 0.05$ . By looking at the mean, it can be concluded that students with high self-esteem have better mathematical communication skills than students with low self-esteem. Comparison of mathematical communication between students with medium and low self-esteem is  $p(\text{sig}) = .302 > 0.05$ . This means that students with medium self-esteem are having the same mathematical communication as students with low self-esteem.

Based on the test statistical analysis above, it can be concluded that students with high self-esteem have better mathematical communication skills compared to the students with low and medium self-esteem. Students with medium self-esteem category are having the same mathematical communication skills with students with low self-esteem.

## CONCLUSION AND SUGGESTION

Based on the results of the research and discussion, it can be concluded that students with high self-esteem have better mathematical communication skills compared to students with low and medium self-esteem. Students with medium self-esteem category are having the same mathematical communication skills with students with low self-esteem.

The suggestion that can be given to the teachers and prospective teachers is to pay attention to the self-esteem that students possess because it can affect students' mathematical communication. It is also suggested for the further researcher to try to examine the self-esteem of other students' abilities.

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