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THE APPLICATION OF TREFFINGER LEARNING MODEL IN IMPROVING STUDENTS' MATHEMATICAL COMMUNICATION SKILL AND THEIR CONFIDENCE

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ABSTRACT

Mathematics is considered as one of very important subjects in educational field. This can be proved by its lesson hour number at school, which is very large number. However, some think mathematics is very hard and boring for its uninteresting learning method. In attempt to eliminate this assumption, Treffinger model, as one of so many methods with their respective advantages, may be considered to be used. This model consists of three core steps, namely understanding challenge, generating ideas, and preparing for action. This study used quasi-experiment as its research method. The population of this study was all junior high school level students in Cianjur regency, meanwhile the sample of this study was 32 students of VIII E as the experimental class and 32 students of VIII G as the control class. The data obtained was then analyzed using the parametric and non-parametric statistical computation. The result of the data analysis showed that there were some improvements in experimental class students' mathematical communication skill and their confidence in learning mathematics compared to those in control class which used conventional learning model as the treatment. The result also showed that there was an quite high association between students' mathematical communication skills on the criteria of high enough. Lastly, the result also showed that there was an association between students' communication skill quality and their confidence on the level of high criteria.

Keywords: Treffinger, mathematical communication, confidence

INTRODUCTION

One of mathematical skills that must be acquired by the students is mathematical communication skill. This is due to the existence of interaction between students and teacher that needs mathematical communication skill which hopefully creates an effective and efficient learning. Mathematical communication skill is a very important component in mathematical learning, a tool to share ideas and clarify mathematical communication (Sumarmo,2015). Apart from cognitive aspect, which affects mathematical learning, affective aspect, which in this case is students' confidence, is also very essential.

Considering the importance of students' mathematical communication skill and their confidence, mathematics teachers should develop the learning by choosing appropriate method, model, approach, and strategy for certain classes' situations in order to achieve the learning objective(s) (Anggriani & Septian, 2019).

Baroody (Ansari in Yuliani, 2015) states that there are two reasons why mathematical communication skill is very important to be acquired. The first reason is that mathematics is viewed as a language which means that mathematics is not only as thinking tool, pattern finder tool, and conclusion taker tool, but also as a valuable tool for communicating a variety of ideas clearly, precisely, and succinctly. The second reason is that mathematics learning is viewed as social activity which means that apart from a mere learning, mathematics is also an interaction device between students and between teacher and students. This is very essential for nurturing children's mathematical potential.

Hatano and Ingaki (Sumarmo, 2015) state that students who have opportunities, motivations, and spirits to speak, write, and listen to something about mathematics, are going to acquire two advantages at the same time. First, they are going to communicate to learn mathematics. Second, they are going to learn to communicate mathematically.

On the other hand, students' confidence is also considered important in mathematical learning, apart from communication skill. Confidence is defined as a belief in oneself which is owned by every individuals. Confidence may also be defined as a way of how an individual view him/herself comprehensively with reference to self-concept (Rakhmat in Hendriana, 2012).

Lauster (Rahmawati, 2017) states that mathematical confidence is one of personality aspects in the form of a belief in one's capability so that not to be affected by others and can act willingly, happily, with optimism, tolerantly, and with responsibility. In addition, Lauster (Hendriana, 2017) also states that confidence is an assured feeling or attitude over one's capability so that he/she will not be worried in doing things he/she wants, can be free in doing things he/she likes and be responsible about it, will be warm and polite in interacting with others, can accept and appreciate others, will have encouragement to achieve things, and will understand more about his/her weakness and superiority. Believing in one's capability will certainly affect achievement and performance level.

There are so many learning methods and models with their respective advantages. However, it is expected that *Treffinger* learning model would be able to develop mathematical communication skill. *Treffinger* model is a learning strategy which is developed from creative learning model that builds mental and features process

Treffinger model is one of few models that handles creativity problems directly and gives practical suggestions of how to achieve alignment. By involving cognitive and affective skills on every levels of this model, *Treffinger* shows mutual relationships and dependencies between these two skills in encouraging creative learning (Nisa, 2011).

Treffinger (Huda, 2013) mentions that this learning model has 3 essesntial components, namely *Understanding Challenge*, *Generating ideas,* and *Preparing for action.*

Another factor that affects students' mathematical skill is an initial mathematical skill. An Initial skill is a learning results gained before acquiring higher level skill. Students' initial skill is a precondition to follow the learning process well. Initial skill is actually one's skills acquired from training, learning, etc., and used to face new experience.

Mathematical communication skill completes each other with another mathematical skill. To optimize this skill, students need to have a high confidence and need to be able to evaluate the connection of mathematical application in daily life. This can be materialized if students have high confidence.

Based on above elucidation, a research entitled "The Application of Treffinger Learning Model in Improving Students' Mathematical Communication Skill and Their Confidence" has been held.

RESEARCH METHODOLOGY

This research method is the experimental study. Two groups or classes have been determined, namely experimental and control class. The *Treffinger* learning model has been given to the experimental class as the treatment, meanwhile the conventional method has been given to the control class. Thus, according to the method, this research is classified as the pretest-posttest-control group design, that is the group design which involves two groups with random sample taking. The dependent variable of this study is mathematical communication skill with students' confidence as the affective aspect. On the other hand, the students' mathematical initial skill has a role as the control variable which has three levels of category, they are high, medium, and low.

The population of this study is all junior high school level students in Cianjur regency, meanwhile the sample of this study is 32 students of VIII E as the experimental class and 32 students of VIII G as the control class. All classes are given the same lesson material that is the polyhedron. The instrument of this research is the qualitative and quantitative data. The quantitative data is gained from the result of the communication skill and the qualitative one is gained from the attitude test result.

RESULT AND DISCUSSION

The gained and analyzed data of this research have been derived from the pre-test, post-test, and obvservational sheet. Based of the data analysis from the pre-test, post-test, and normalized N-gain of the communication skill, it was gained the mean score () from the ideal score, the standard deviation (sd). For more detail, please pay attention to the Table 1.

Tabel 1. The Description of Mathematical Communication Skill Test

Skill		TREFFINGER Learning			Conventional Learning		
		Pre-test	Post-est	N-Gain	Pre-test	Post-test	N-Gain
Communication		14.41	22.81	0.503	13.75	19.75	0.334
	sd	4.118	4.366		3.681	3.601	

Information : Mathematical Communication Test Ideal Score = 32

The mean result of the communication skill test of the experimental class was 22.81, while the control class was 19.75. The Experimental class N-gain appeared to be bigger than the control class. This showed that there was a difference between those who were given the Treffinger model learning as the treatment and those who are given the conventional model learning.

The research data were categorized based on the students' mathematical initial skill. This was purposed to comprehend the initial knowledge of the students' before the lesson was started and to know the equality of the research sample. The students from these two classes are grouped according to their mathematical initial skill level namely high, medium, and low. This grouping was based on the mean ( ) and the standard deviation (sd). From this criteria, the sample distribution based on their initial skill can be seen on table 2 as follow:

Table 2. The Sample Distribution based on the Initial Skill

Approach	The Mathematical Initial Skill Level			Total
	High	Medium	Low	
Treff	7	17	8	32
PkV	9	16	7	32
Total	16	33	15	64

After the pre-test and the post-test had been administered, the N-gain had then been obtained for each classes to see if there was an improvement of students' mathematical communication skill of the Treffinger and conventional learning model class.

The normalized N-gain was purposed to know how big the improvement of students' mathematical communication skill before and after the lesson. The N-gain results of the two classes can be seen on the table 3.

Table 3 Statistical Description of Mathematical Communication Skill N-gain Data

	Class	N	Mean	Standard Deviation
N-Gain	Eksperimental	32	0.503	0.182
	CKontrol	32	0.334	0.124

It appeared on table 3 that the N-gain means value of the experimental class was 0.503, meanwhile the control class was 0.334. This showed that there was a difference in term of students' mathematical communication skill improvement. The two means test then was administered to know and analyze the mathematical communication skill improvement of the students whose Treffinger model as the treatment and the students whose the conventional approach as the treatment.

The result of the two-lines Anova and the N-gain of the experimental and control class communication skill can be seen on the table 4.

Table 4. Two-lines Anova Test and N-gain of Mathematical Communication Skill based on the Learning Approach and the Mathematical Initial Skill

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.257[a]	5	.251	20,157	.000
Intercept	10.561	1	10,561	847,009	.000
Initial Skill	.585	1	.585	46,910	.000
Learning	.685	2	.343	27,471	.000
Initial Skill * Learning	.152	2	.076	6.089	.004
Error	.723	58	0.12		
Total	13.169	64			
Corrected Total	1.980	63			

Based on the Table 4, it appeared that for the learning factor the counted F was 0.685 with its significance was 0.000. This value met the criteria of *Sig.* 0.05 which means that *Ho* was rejected. Thus, the mathematical communication skill means scores between experimental and control class were not the same (there was a significant difference).

The table 4 has also shown that the learning factor with mathematical initial skill had 0.585 F counted with its 0.000 significance. This value also met the criteria of*Sig.* 0.05 which means that the mathematical communication skill between students' intial skills (low, medium, and high) were not the same (there was a significant difference).

It also appeared on the table 4 that the interaction between learning approaches with initial skill had the significance value of *Sig* .0.004. This value meet the criteria of *Sig* $\leq$.0.05, then it appeared that there was significant mathematical initial skill interaction

between the experimental and control class. This means that there was significant difference between N-gain of communication skill of the experimental and control class. Generally, the *Treffinger* method affect significantly to the students' mathematical initial skill in developing their mathematical communicaiton skill.

From the data processing of students' confidence, it was seen that generally the students' confidence mean score was 75.13. This showed that the mean category of students' confidence was on the level of medium.

To see if there was an association between communication skill and students' confidence, the C*hi-Square* (X^2) was then administered with the level of trust on 0.95 or the level of significance on = 0.05. Based on the gained *r* value, which was 0.255, then it can be concluded that the associaion degree between mathematical communication skill and the confidence was categorized as low association level.

CONCLUSION

Based on the data analysis and the discussion of research result, it can be concluded that the improvement in mathematical communication skill and confidence of *Treffinger* learning model students class was better than those who in the conventional learning model class. Also, there was an association between mathematical communication skill and confidence on the category of high.

That is why, based on the conclusion, some suggestions are then arisen, they are: (1) the *Treffinger* learning model should be applied on the learning of mathematics, especially on the selected and essential topics. (2) in the *Treffinger* learning model, students are encouraged to build their own creativity in Their abilities and knowledges through Student Worksheet, There fore the teacher should prepare and design the taks and activities optimally. (3) Seeingthat the scope of this research's subject is narrow, then the future researchers may need to do research on the wider subject. Moreover, it is very possible to do further research on this *Treffinger* learning model with wider population, different school level, and different subject.

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