

# The Increasing Students' Mathematical Creative Thinking Ability using Treffinger Model of Indonesian Lower Secondary Students

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Abstract: One of mathematics teaching goals is to improve students' mathematical creative thinking ability as they are able to solve problems in variety ways. The purpose of this study was to analyze the increasing of students' mathematical creative thinking ability by using Treffinger at student lower secondary school. Treffinger Model is a collaborative learning using divergent and convergent thinking processes. The research method used in this study was a quasi-experimental research design using pre-test and post-test design. As a sample, there were two groups of students grade VII SMPN 2 Unggul Mesjid Raya Aceh Besar that was chosen randomly. The study results showed that students' mathematical creative thinking ability taught by using Treffinger model is better than students' mathematical creative thinking ability taught by conventional model. There was an increasing of each students' mathematical creative thinking ability indicator in experimental group, namely, flexible increased significantly from 0.00% to 70.69%, fluency raised from 50.00% to 89.66%, and elaboration grew from 20.69% to 77.59%.

## 1 INTRODUCTION

Thinking skills consist of recall thinking, basic thinking, critical thinking, and creative thinking (S. Krulik and Rudnick, 1999). Recall thinking and basic thinking are categorized to lower order thinking, while critical thinking and creative thinking are categorized to higher order thinking.

Mathematical creative thinking is a reflective pure thinking that produces a complex product (Alimuddin, 2009). Prasetyo et al. (2014) stated that a creative thinking is a usual thinking related to intuition that encourage imagination and give a novel possibility which produce great ideas that is not expected. As a result, a creative thinking is a thinking process that produces variety ideas to solve a problem.

A creative thinking skill is an integral part in education. Permendikbud (2016) stated that authentic learning in mathematics focuses on (1) process and product oriented in solving problem (2) a reasoning to improve logic, critical, analytic and

creative. A creative thinking is added as instructional strategy and lesson plan as well.

Mathematics is able to train the thinking to improve reasoning. As the result, logical, critical, analytic and creative thinking will improve as well. However, in practices, students' activity and achievement is not quite good yet. Based on preliminary study on SMPN 2 Unggul Mesjid Raya Aceh Besar, it was found that a mean score of each indicator of students' creative thinking ability is low namely flexible indicator 8%, fluency indicator reached 64% which no one can produce an original idea in solving problem, and elaboration indicator 39%. The problem faced is needed to solve by using instructional model that is able to explore students' creative thinking. One of model used is Trefingger Model. Trefingger model is a model that combines two domains of learning namely cognitive and affective domain. Moreover, the model describes level of learning start from basic level to complex level

There are 3 levels of Treffinger Model namely basic tools, practice with process, and working with

real problems. Level 1 (basic tool) consist of divergent thinking skills and creative technique. As introduction, divergent function consists of the improving of fluency, flexibility, originality, elaboration. Level 2 (practice with process) is a chance given for students to practice the skills that have been learnt in level I. Level 3 (working with real problem) is applying skills learnt in two level toward a challenge in real world (Nisa, 2011)

Study of model Treffinger showed that students' mathematical creative thinking ability taught by using Treffinger model is better than students' mathematical creative thinking ability taught by conventional model. In addition, there is a positive response of students toward applying Treffinger model in mathematics learning (Rohaeti, 2016).

From the background, it is a need to study about "The influences of Treffinger Model towards students' mathematical creative thinking in lower secondary school". There are some research questions (1) How is students' mathematical creative thinking in lower secondary school after applying Treffinger Model? and (2) How is students' mathematical creative thinking in lower secondary school after applying Treffinger Model and conventional model.

## 2 METHOD

Quasi Experimental design using pre-test and post-test with qualitative approach was used in this study. The Sample is students grade VII SMP Negeri 2 Unggul Mesjid Raya Aceh Besar year 2017/2018. Grade VII-1 was chosen as experiment group and grade VII-2 as control group. The primary Instrument is creative thinking ability item with its rubric. While supporting instrument is lesson plan and students' worksheet.

## 3 RESULT STUDY

### Students' Mathematical Creative Thinking Ability

This analysis was used to determine the influences of students' mathematical creative thinking before and after applying Treffinger Model. The picture below showed that students' mathematical creative thinking before applying Treffinger model. It is clear that students' mathematical creative thinking is low level.

Based on the answer on Figure 1, it is seemed that the indicator *flexible*, CS got score 2. It means that she is able to give one-way answer with correct

computation. The answer that she gave is correct. In the case of the fluency indicator, she got score 4. It means that she is able to give relevant ideas and correct answer without doing a mistake. In addition, the elaboration indicator, CS got score 3 because she is only able to give a correct answer, but the answer given is not detail. Moreover, the original indicator, she got score 0 because the answer given is similar to other friends in his class.

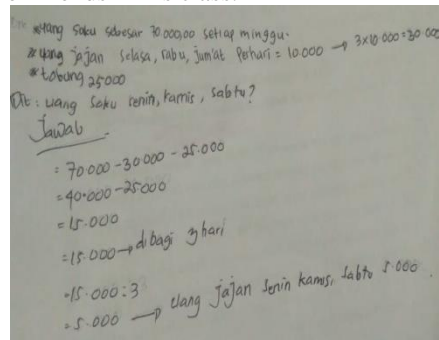


Figure 1: Students' pre-test of students' mathematical creative thinking.

Based on the answer given on Figure 2, it is found that RN got score 1 on the flexible indicator. It means that he is able to give one-way answer even though there are some mistakes given. However, R got score 2 on fluency indicator because he is only able to give a relevant idea, but the answer given is not fully correct. In the case of elaboration indicator, RN got score 1 because he did some mistakes on answering and the answer, he gave is not detail. Moreover, original indicator, he got score 0 because the answer given is similar with other students in is classroom.

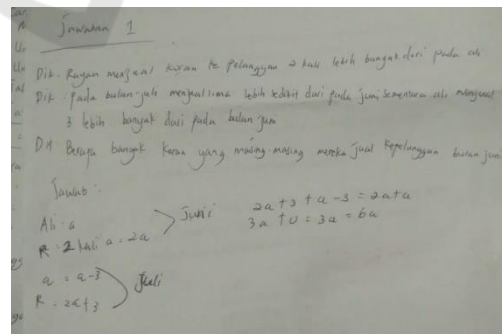


Figure 2: A student (RN) pre-test answer of creative thinking.

From the answer given on Figure 3, it is found that RN got score 4 on flexible indicators. It means that he is able to give more than one answer with correct computation. Like flexible indicator, RN got score 4 on fluency indicator. It means that he is able

to give a relevant idea with a correct solution. However, CS got score 3 on elaboration indicator, it means that she is able to give a correct answer without detail. Like the answer before, the original indicator could not reach by the student, and he got score 0 because the answer give is similar to other students in her classroom.

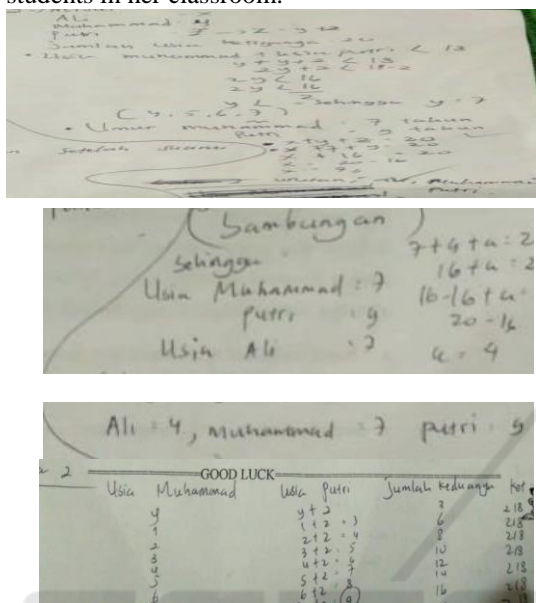


Figure 3: A Student (RN) pre-test answer of creative thinking.

Treffinger model enables students to develop their creative thinking ability since in the first level, it uses open-ended questions to encourage students to think flexibly, originally and fluently. In addition, in the second level, both students are encouraged to have a role in working groups. In this level, they will be given complex questions. The purposes of these activities are to encourage students to think creatively with working-learning activity.

Moreover, the third level, the model used is creative thinking technique. In this level, student was asked to answer non-routine question relate to their real world. The students were asked to get solution of the problem given to encourage them to think creatively.

The data analysis in Table 1 showed that the creative thinking indicator is increasing in each indicator except original indicator. As the result, it is concluded that Treffinger Model has a positive impact towards students' mathematical creative thinking.

## 4 DISCUSSION

### Students' Mathematical Creative Thinking

After applying Treffinger Model on learning process, there is an increasing of students' mathematical creative thinking of each indicator except original indicator. In original indicator, both pre-test and post-test, the student's achievement is categorized as low ability. It is caused by some reasons: (1) the topic of learning is less effective to develop original indicator (2) original indicator is one of the difficult indicators to improve because students need to find the solution that is not similar with other students. Moreover, the original indicator needs more time to develop. However, the researcher conducts 3 meeting classes, for the reason, it is predicted that the original indicator did not increase.

Table 1: Students pre-test and post-test achievement on creative thinking ability.

Experiment Group Post-Test			
No	Observing Aspect	Low	Good/Excellent
1.	Originality	100%	0.00%
2.	Flexibility	29.31%	70.69%
3.	Fluency	10.34%	89.66%
4.	Elaboration	22.41%	77.59%
Control Group Post-Test			
No	Observing Aspect	Low	Good/Excellent
1.	Originality	100%	0.00%
2.	Flexibility	75%	25.00%
3.	Fluency	30%	70.00%
4.	Elaboration	50.85%	49.15%

It was predicted that the original indicator would not increase in this research. There are three reasons why the indicator did not increase. Firstly, the Acehese students do not have a habit to think dependently. it means that students are still thinking as their habitual thinking. For this case, further research needs to conduct in order to focus on encouraging students to think "out of the box".

Secondly, the students feel afraid or not feel confidently in asking or answering the question from the teacher. The culture of "a shame" is affected in creating original ideas because the students choose

being silent rather than asking or answering the question.

In other hand, the different thing happens to 3 other indicators. The flexible indicator increases from low level with 100% to 29.31%, while good or excellent categorized increase 0% to 70.69%. For fluency indicator fluency, the number of students with low categorized decrease from 50.00% to 10.34%, on the other hand, students reached good and excellent categorized increase from 50.00 % 89.66%. The last indicator, elaboration, the number of low achievement student decrease from 79.31% to 2.41%, while students who reach good/excellent categorized increase from 20.69 % to 77.59%.

Treffinger Model is one of learning models that is reliable, visible and applicable model in teaching and learning (Supriyono, 2011). In addition, the model has success in order to teach learners in achieving divergen thinking (Wirahayu, Purwito, Juarti, 2018). Moreover, there are stated that Treffinger model is able to improve students' creativity (Pomalato, 2006; Siswati, 2011; Haryono, 2009).

## 5 CONCLUSION

This study showed that Treffinger model has a good impact on students' creative thinking ability. Moreover, it is claimed that students' creative thinking ability taught by Treffinger model is better than students' creative thinking ability taught by conventional model.

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