

# The Effect of Mathematics Learning With using Reciprocal Teaching Model on Mathematics Creative Thinking Ability

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**Abstract.** The problem in this research was whether there was an effect of using a reciprocal teaching model on mathematics creative thinking ability of grade VIII students. The objective of this research was to find out the effect of using a reciprocal teaching model on mathematics creative thinking ability of grade VIII students. This research used quantitative method with a quasi-experimental type of research. The population in this research was all of grade VIII which consisted of two parallel classes. Sample in this research took those two classes where VIIIA as experimental class and class VIIIB as control class. The instrument used in this research was test. The research outcome obtained was mean score of the experimental class was 73.28. Meanwhile, at the control class, it obtained mean score was 62.10. from hypothesis test result with using t-test obtained  $t_{count} = 5.082$  with  $df = 30$  sig. (2-tailed) at  $0.000 < 0.05$  can be concluded that  $H_0$  was rejected and  $H_a$  was accepted. The application of reciprocal teaching-learning approach had an effect on mathematic creative thinking ability of grade VIII students year 2017/2018.

## 1. Introduction

Learning is an active process of reacting to all situations that exist around the individual. Learning is also a process of doing through various experiences of seeing, observing, and understanding something. Quantitatively, learning means the activity of developing cognitive ability through as much fact discovery. The level of creativity does not only depend on the cognitive aspect but also it is determined by other factors such as attitudes, motivations, values, and personality traits or creativity is determined by the cognitive and non-cognitive aspects. Some of the creative personality traits put forward by Kuwanto include: a) The curiosity that is meant in this scope is the desire to get extensive experience, the desire to ask and try, interested in something that isn't clear yet, full of enthusiasm, adventurism, ambitious, broad interest, persevering, and never give up; b) The nature of the assets/creative people is usually more concerned with work, not the person, so that sometimes less concerned with good personal relationships. This assertiveness appears in discipline and firmness, and c) The courage to risk some of the attitudes in this group is not afraid to be criticized, do not hesitate, dare to defend opinions and dare to admit mistakes. According to [7] that Critical thinking is the process of finding, obtaining, evaluate, analyze, balance, and conceptualize information as guide to developing thinking about someone with self-awareness and the ability to use



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information by adding creativity and take risks. Critical thinking is reasonable, reflective thinking that is focused on deciding what to believe or do [3].

Mathematics is one of the subjects that is still considered difficult for students to understand. Therefore, in the mathematics learning process we need a variety of teaching methods. In the use of teaching methods, it does not have to be the same for all subjects, because it can happen that a particular teaching method is suitable for one subject but not for other subjects. The reality that occurs is the students' mastery of mathematical material is still relatively low when compared to other subjects. This condition also occurs in MTs Negeri 4 Buton Tengah. Based on the results of interviews with mathematics teachers who teach in class VIII that the mastery of mathematics material by students is still relatively low. This can be seen from the average results of students' mathematics learning achievement in the odd semester of 2018 of 5.6. This can be due to the availability of teaching materials, the learning model used, the factors of student learning environment, and other factors.

The availability of teaching materials used by teachers aims to facilitate students learning mathematics. Teaching materials are also prepared by students in order to improve the creative thinking abilities of teachers and students. According to Tomlison that teaching materials are made to improve students' knowledge and experience. The teaching material is also inseparable from mathematics lessons. Once the importance of learning mathematics so that it is taught from Elementary School level to Higher Education. Learning mathematics has an important role in the development of a nation. Every human activity is done with calculations, and these calculations require mathematics. Suggested the need to learn mathematics because mathematics is a means of thinking clearly and logically, a means for solving problems of daily life, a means of recognizing relationships and generalizing experiences, a means for developing creativity, and a means for raising awareness towards cultural development.

Creative thinking according to Krulik and Rudnick is at the highest level of reasoning thinking which is above the level of remembering (recall thinking), basic thinking, and critical thinking. According to Pehnoken [1], creativity does not only occur in certain fields, such as art, literature, or science but is also found in various fields of life, including mathematics. The discussion of creativity in mathematics is more emphasized in the process, namely the process of creative thinking. Therefore, creativity in mathematics is more properly termed as mathematical creative thinking. The importance of creative thinking in mathematics is stated by Bishop [2] which states that a person needs two mathematical thinking skills, namely creative thinking that is often identified with intuition and analytic thinking ability identified with logical thinking ability. Indicators of mathematical creative thinking Fluency: Smoothness provides many ideas to solve a problem, 2) Flexibility: can bring up new ideas (try in other ways) in solving the same problem, 3) Originality : Can generate extraordinary ideas to solve a problem (can answer in its own way), 4). Elaboration: Can develop ideas from existing ideas or detail problems into simpler problems.

One of the learning models that actively involves students is the cooperative learning model. Cooperative learning model is very suitable to be applied in mathematics learning because in learning mathematics it is not enough to only know and memorize mathematical concepts but also requires an understanding and ability to solve mathematical problems properly and correctly. Through this learning model, students can express their thoughts, exchange opinions, cooperate with each other if there are friends who experience difficulties. This can improve student achievement in studying and mastering mathematics learning material so that later it will improve students' mathematical creativity abilities.

The cooperative learning model that can activate and be able to improve students' overall creative abilities while developing aspects of personality such as working together responsibly and discipline are the cooperative learning model of Reciprocal Teaching type. The Reciprocal Teaching Model is a self-learning activity that includes four aspects: encompassing, making questions, explaining again and predicting. The Reciprocal Teaching is a constructivist approach based on the principles of making or asking questions. Reciprocal Teaching is designed to develop students' creative thinking abilities towards students' material

being studied. Revealed the advantages of this Reciprocal Teaching model, namely: a) Developing student creativity, b) Fostering cooperation between students, c) Growing student talent, especially in speaking and developing attitudes, d) Students pay more attention to lessons because they live themselves, e) Cultivate the courage to think and speak in front of the class, f) Train students to analyze problems and draw conclusions in a short time, g) Foster an attitude of respect for the teacher because students will feel the teacher's feelings when students are busy or not paying attention, h) Can be used for large subject matter and limited time allocation.

Reciprocal Teaching model is one of learning approaches which has characteristics of scientific learning which is very appropriate to apply in learning Mathematics. Scientific models become a useful tool for supporting the constructivist process, in which learners from their own schema to assimilate new concepts [6]. According to [5] are reciprocal teaching is an instructional method in which small groups of students learn to improve their reading comprehensions through scaffold instruction of comprehension monitoring strategies. Reciprocal Teaching Strategy encourage students to take roles more active in leading dialogue group, and help to bring more meaning for the text at the level personal and cognitive [2]. This learning is emphasize on students that learning Mathematics in not only a rote learning, but also is stimulating the students' reasoning power, so that it is expected to be able to solve the mathematical problem well and correctly.

The steps of Reciprocal Teaching learning According to [4], are as follows: a) The teacher tells the learning objectives and motivates students, b) The teacher provides information and a flow of learning Reciprocal Teaching model to students, c) The teacher groups students into several heterogeneous groups with each group of 4-5 people, d) The teacher distributes a set of Reciprocal Teaching cards (clarifying discussion leader cards, predicting discussion leader cards, questioning discussion leader cards, and summarizing discussion leader cards), learning reading material, and Group Worksheet, e) Groups that have gotten 4 cards, each group member chooses cards randomly, f) After each the student get the cards, the students discuss in groups by conducting four discussions, namely: (clarifying discussion, predicting discussion, questioning discussion, and summarizing discussion) based on worksheet that has been established teacher's instructions, g) The teacher walks around the class checking the results of group work and the activities of students in discussions, h) After the student has finished the discussion, the teacher asks representatives of one group to present the results of the discussion, i) Through a question and answer session, the teacher evaluates the results of the discussion and student understanding of the material that has been learned, j) The teacher reflects on the success of the learning model of Reciprocal Teaching.

## 2. Research Method

This research used quasi-experiment method, with the independent variable was Reciprocal Teaching-learning and the dependent variable was creative thinking. The design of the research used was posttest only control group. This research was conducted in MTsN 4 Buton Tengah, Buton Tengah Regency, at students of grade VIII. The sample of the research was chosen by using a purposive sampling technique so that grade VII.A and VII.B were chosen respectively as the experiment class and the control class with a total of 32 and 31 students respectively. The instruments used in this research were the test of the ability of students to think creatively on the subject matter of geometry and the observation sheets of teacher and students' activity. The data analysis technique used 2 analysis, they were descriptive analysis and inferential analysis. The research hypothesis testing used a t-test through SPSS 22 for windows. Conclusion drawing criteria was  $t_{\text{count}} < t_{\text{table}}$   $H_0$  was rejected,  $D_f = n_1 + n_2 - 2$ ,  $\alpha = 0.05$ , or the conclusion drawing was  $H_0$  was rejected if the calculated significance level  $<$  significant level was established ( $\alpha = 0.05$ ).

## 3. Result of Research and Discussion

Based on the posttest result, the students' creative mathematical thinking abilities descriptively namely in the experimental class, the ideal score was 100, a minimum score was 55, a maximum was 90, a mode was 80, an average was 73.28, a median was 75, standard deviation was 8.29, and a variance was 68.725. Whereas in the control class, the ideal score was 100, the minimum score was 45, the maximum was 80, the mode was 60, the median was 60, the average was 62.10, and the variance was 74.624. The results of students' creative thinking abilities in class VIII.A and VIII.B MTsN 4 Buton Tengah can also be seen in the distribution table 1.

**Table 1.** Score Distribution of Mathematical Reasoning Abilities of Students Taught with PBL and Conventional

Score Range	Student Mastery Level	RT		Conventional	
		Freq	Percentage (%)	Freq	Percentage (%)
$86 \leq X \leq 100$	Very Creative	1	3.5	0	0
$71 \leq X < 86$	Creative	10	31	1	3.5
$56 \leq X < 71$	Creative Enough	20	62	19	61
$42 \leq X < 56$	Less Creative	1	3.5	9	28
$0 \leq X < 42$	Very Less Creative	0	0	2	7.5

The result of inferential analysis showed that the data generated were normally distributed based on the Kolmogorov Smirnov test. Likewise the two groups (Experiment class and Control class) came from a class with homogeneous variance data in accordance with the Lavene Test results. Based on the result of hypothesis testing using the t-test (Independent Sample Test) the analysis results obtained  $t_{\text{count}} = 5.244$  with a significant level of 0.000. When compared with a significant level of 0.05,  $0.000 < 0.05$  results were obtained,  $H_0$  was rejected or in other words the Reciprocal Teaching-learning model had an effect on the creative thinking ability of students of grade VIII MTsN 1 Buton Tengah on the subject of Geometry.

Based on the observations of the implementation of mathematics learning using the Reciprocal Teaching (RT) model on the Geometry material in the first meeting was 73.36%, the second meeting was 80.9%, the third meeting was 85.4%, the fourth meeting was 90%, the fifth meeting was 100%, and sixth meeting was 100%. While student learning activities in PBM learning were from the first meeting to the sixth meeting in a row 57%, 70.33%, 78.7%, 85%, 90.67%, and 100%. The observations in the Experimental class obtained descriptively can be concluded that there was an increase in students' learning behavior/character. Most students already have an attitude of trustworthiness, conscientiousness, respect, and a sense of social responsibility, fair and caring. From the learning process it was also known that some students showed some skills namely 1) how to clarify the answers expressed by their friends already addressing scientific principles, 2) students appreciated different opinions, 3) students could show good ideas/opinions, 4) students often asked if there were things that were not understood, 5) students summarized the knowledge in writing or verbally. These five things were also outlined by students in answering questions. So that this can be concluded it has shown creative things in accordance with the opinions of experts.

#### 4. Conclusion

Based on the result of the research, it can be concluded that the learning model of Reciprocal Teaching affects students' mathematical creative thinking ability at grade VIII of MTsN 1 Buton Tengah at subject matter of Geometry. Descriptively, the ability of students' mathematical creative thinking ability was taught by using the learning model of Reciprocal teaching was in very creative category.

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