# IMPROVING STUDENTS' CREATIVE THINKING ABILITY THROUGH PROBLEM POSING-GEOGEBRA LEARNING METHOD

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## Abstract

Creative thinking ability as an important achievement when students learned mathematics. It could be improved by using problem posing learning approach. Recently, teaching and learning should facilitate technology as instructional media. Geogebra is familiar instructional media to support mathematics instruction. Combination problem posing-geogebra give a challenging to enhance teaching-learning effectively.

The purpose of this research is to describe the teacher's ability in managing learning, students' activity, students' response of learning, students' creative thinking ability, and the quality students' problem. This research include to descriptive quantitative. Data were collected by using test, observations, and questionnaires. Test is used to obtain data of the students' creative thinking ability after problem posing learning and to know about the quality of the students problem. Observation is used to obtain data of teacher's ability to manage learning and students activity. While the questionnaire is used to study about students response of problem posing learning. Analysis in this research is quantitative approach.

Results of this research are: (1) Teacher's ability to manage learning is on excellent and good criteria with score 4 and 3. (2) Subjects is on the criteria active during learning time, with the percentage of 56.4%. (3) Students' response to the learning that has been implemented is positive. (4) Students in LCT 4 is 9.52%, in LCT 3 is 19.05%, in LCT 2 is 4.76%, in LCT 1 is 47.62%, and in LCT 0 is 19,05%. (5) Quality of student's problems in excellent category is 23.8%, in good category is 47.6% and in good enough quality is 28.6%. **Keywords:** learning, problem posing, geogebra, creative thinking

#### BACKGROUND

Science and technology was developing today and change all aspects of life, especially education. Indonesian government is developing the curriculum of 2013 based on scientific to resolve thus change. One of the aim of Indonesia national education is to develop the potential of students to be creative (Permendikbud number 20 years 2016). Thus curriculum suggests that learning in schools should develop students' creative potential. This is supported by Warli (2005) which states that learning can be said to be good if the learning not only accepts, gathers, and memorizes some information, but also able to improve the ability to think and act creatively. Such that, it can be realized by improving creative thinking of students in learning.

In improving students creative thinking should developed by all subjects of education without exception mathematics. However, mathematics learning in schools still has not emphasized the students' creativity. In learning mathematics, creativity is rarely improved. Teachers more often use teacher center learning. They only give examples then exercises and do not allow students to show their own ideas or representations. Even though mathematics is a creative work (Matsko and Thomas, 2015). If mathematics learning usually use teacher center continuously will cause a sense of saturation that result students lazy to receive a learning because they are not given the freedom to be creative, independent learning and put forward their ideas and opinions. So that teachers must be more creative in choosing and applying the model of learning that will be used in the classroom.

Problem solving can be used to solve this problem. This is supported by Getzels and Csikszentmihalyi (in Silver, 1997) stated that the central of creative artistic experience is problem finding (posing). Creative thinking is understood as the cognitive ability to create and discover. While problem posing refers to generating something new or revealing something new from a set of data (Singer and Voica, 2015). So it can be concluded that problem posing can lead to creative ideas of students so that it can be used to improve creative thinking. This is supported by the results of Silver and Leung's research (in Siswono and Kurniawati, 2004) that creativity related to problem solving and problem solving can be used as a means of assessing or measuring students' creative ability. Therefore problem posing can be used to improve the creative thinking ability of students.

Problem posing can be carried out individually or in groups, but in this study the researchers choose to be carried out in groups. Group is one way to overcome the lack of problem posing learning that requires more time for students to complete their tasks (Siswono, 1999). Shanti and Abadi (2015) stated that cooperation among students can spur creativity and complement their shortcomings. So that problem posing with grouping will make students creative thinking. Such that in this research use the syntax of problem posing learning by Siswono (2008) with discussion method.

Matched materials used to improve creative thinking skills are materials that require a high level of creative thinking such that it can to outline all levels of creative thinking ability of learners. Rizal (in Nurhasanah, 2010) states that geometry is part of mathematics that occupies a position of concern compared to other branches of mathematics because it takes a high level of creative thinking to learn it. Similarly, on the material of cubes and cuboid that are part of the geometry. Therefore, the material of cubes and cuboid will be very supportive to improve the students' creative thinking ability.

Teaching and learning should facilitate technology as instructional media. Geogebra is familiar instructional media to support mathematics instruction. Combination problem posing-geogebra give a challenging to enhance teaching-learning effectively.

Students have different abilities. Therefore, students carry out different level of creative thinking. Based on three component of creative product by Silver (1997) and the level of creative thinking (LCT) by Siswono (2006). The description of LCT is described the following.

- Level 5: Result of student's task satisfied all criterion of creativity product. Student can synthesize ideas, generate new ideas from mathematical concepts and real life experience, and applying ideas to construct some problems also revised when they find a hindrance.
- Level 4: Result of student's task satisfied all criterion of creativity product. Student can synthesize ideas, generate new ideas from mathematical concepts and little real life experience, and applying ideas to construct some problems also revised when they find a hindrance.
- Level 3: Result of student's task satisfied all criterion of creativity product. Student can synthesize ideas, generate new ideas only from mathematical concepts, and applying ideas to construct some

problems also revised when they meet a hindrance.

- Level 2: Result of student's task satisfied just one or two criterion of creativity product. Student can synthesize ideas from mathematical concepts or real life experience, and generate new ideas only from mathematical concepts or real life experience. He/She hasn't applied all ideas to construct some problems, but he/she can revise a problem when they looked a hindrance.
- Level 1: Result of student's task satisfied just one or two criterion of creativity product. Student cannot synthesize ideas from mathematical concepts or real life experience, and generate new ideas only from mathematical concepts or real life experience. He/She hasn't applied all ideas to construct some problems, also revised a problem when they looked a hindrance.
- Level 0: Result of student's task did not satisfy all criterion of creativity product. Student cannot synthesize ideas from mathematical concepts or real life experience, and generate new ideas. They just recall their ideas.

Derived from the background, this research is trying to describe teacher's ability in managing learning, students' activity, students' response of learning, students' creative thinking ability, and quality of the students' problem.

# METHOD

This study is a descriptive study that used a quantitative approach. The aims of this research were analyzed the teacher's ability in managing learning, student's activity, student's response of learning, student's creative thinking ability, and the quality of the student's problem. This research was conducted in one class grade eight of MTs Babul Futuh Tudan Pasuruan. Data were collected by using test, observations, and questionnaires. Test is used to obtain the test results data of the student's creative thinking ability after problem posing learning and to know about the quality of the students problem. Observation is used to obtain data of teacher's ability to manage learning and students activity. While the questionnaire is used to study about students response of problem posing learning.

#### **RESULT AND DISCUSSION**

In this research, geogebra is used to present the animation of cube, cube nets, cuboid and cuboid nets. Teacher show the animation in the main activities to explain the material in the first and second meeting.

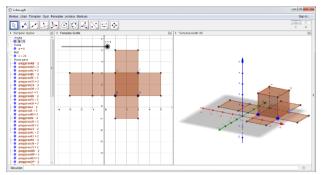


Figure 1. The animation of cube and cube nets in Geogebra

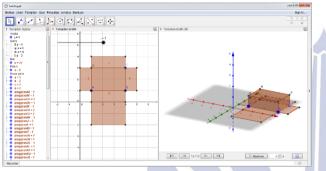


Figure 2. The animation of cuboid and cuboid nets in Geogebra

Every aspect of assessment on observing teachers' ability to manage learning in first and second meetings overall gets scores 4 and 3 with criteria very good and good. This shows that the management of the teacher's learning is corresponding with the lesson plan that has been made.

Based on the percentage of student activity, the average percentage of all student activities besides listening to teachers and behaving irrelevant is 56.4%. This shows that student activity can be said to be active because the average percentage amount of all student activity, except listening to teacher and behaving bad or irrelevant more than equal to 50%.

The result of every items of student response questionnaire shows the percentage more than 50%. It means that students' responses is include strong or very strong categories and can be said positive. There are 11 items of questionnaire statements that are included in the criteria are very good and 3 items are good criteria. Item number 3 with statement that is doing the question made yourself more fun get the highest percentage of 90.48%. This suggests that students are very receptive to the problem posing learning.

Based on the data stated that students at level of creative thinking (LCT) 4 level is 9,52%, level of creative thinking (LCT) 3 is 19,05%, level of creative thinking (LCT) 2 is 4,76%, level of creative thinking (LCT) 1 is 47,62% and level of creative thinking (LCT) 0 is 19,05%. Next will be explained about each student's analysis with level of creative thinking (LCT) 4, level of creative thinking (LCT)

# 3, level of creative thinking (LCT) 2, level of creative thinking (LCT) 1, and level of creative thinking (LCT) 0.

© Rohan ingin membuat. Kerangko balok de	ngan
ukuran panjang so cm, lebar 25 cm dan ting	)i
us on. jika Rehan mempunyai kawat sepan) 500 cm. berapakah -kawat yang tersisaz	ang
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P = 50 cm L = 25 cm t = 15 cm.	
$= 4 \times (P + l^2 + t)$	
$= 4 \times (s0 + 2s + 1s)$	
= 4x (90) = 360	NGRON -
kavat tersisa = 500 - 360 = 190	
jadi, kaviat yang tersisa adalah 140	
Hendik akan mengecat sebuah ruangan berb kubus dengan panjang rusule smeter ia hanya	en tuk meng-
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kemudian, biaya yang dibutuhkan untuk mengecat adalah Rp.5.000/m°. tentukan biaya, yang dibutuh Kan pank Hendik untuk mengecat.

Punyelesaians = (5x (5x5)) -2,8

- = (5×25) 2.8 = 125 - 2.8
- = 122,2 × 10.000
- = 1.222.000 m2
- (3) diketahui volume balok adalah qoo cm? bagaimana cara menemukan ukuran balok tersebut? berapa banyak kemung kinan ukuran - ukuran yana; kalian temukan?

penyelesaian :

400	-	20×20×1-D	jayraban	1	
		20 ×5 × 4 -1			
400	11	50 ×8×1-D	jav/aban	3	
400	1=	200×2×1-D	jaylaban	4	
400	) =	16×25×1-D	javraban	5.	

Figure 3. The result of creative thinking in problem posing

test of students in level of creative thingking 4 The results analysis of the student problem posing with the ability level of creative thinking 4 shows that student be able to fulfill the three of creative thinking indicators which are fluency, flexibility, and novelty. Fulfilled the indicators of fluency because the student are able to possess at least three problems and able to solve the problem that has been made. On the indicator of flexibility, the student are able to possess problem with many different solutions as in the Figure 3. The novelty indicator is fulfilled because the student are able to make a problem different from the problems it possess.

There are 2 of 21 students included into the level of creative thinking (LCT) 4. Both are able to fulfill the three

creative thinking indicators. Such that the percentage of students in LCT 4 is 9.52%.

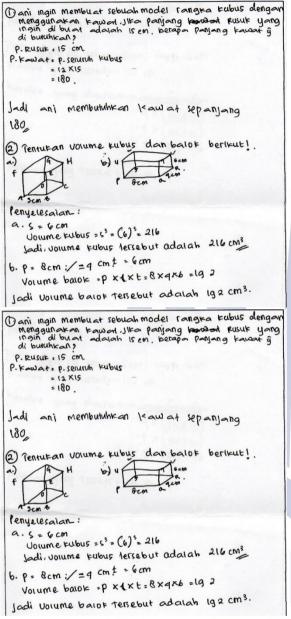


Figure 4. The result of creative thinking in problem posing test of students in level of creative thinking 3

The results analysis of the student problem posing with the ability level of creative thinking 3 shows that student be able to fulfill two of creative thinking indicators which are fluency and novelty. Fulfilled the indicators of fluency because the student are able to possess at least three problems and able to solve the problem that has been made. On the indicator of flexibility, the student are not able to possess problem with many different solutions. The novelty indicator is fulfilled because the student are able to make a problem different from the problems it possess.

There are 4 of 21 students included into the level of creative thinking (LCT) 3. Such that the percentage of students in LCT 3 is 19.05%.

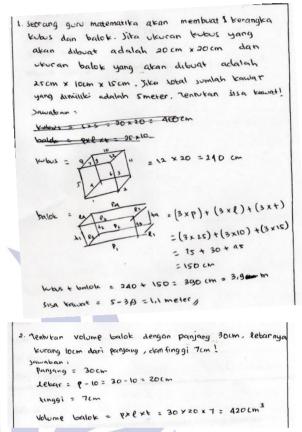


Figure 5. The result of creative thinking in problem posing

test of students in level of creative thingking 2

The results analysis of the student problem posing with the ability level of creative thinking 2 shows that student be able to fulfill two of creative thinking indicators which are flexibility and novelty. Does not fulfilled the indicators of fluency because the student are not able to possess at least three problems and able to solve the problem that has been made. In the Figure 5 show that student are able to possess problem only two. On the indicator of flexibility, the student are able to possess problem with many different solutions. The novelty indicator is fulfilled because the student are able to make a problem different from the problems it possess.

There is 1 of 21 students included into the level of creative thinking (LCT) 2 is 1 students. Such that the percentage of students in LCT 2 is 4.76%.

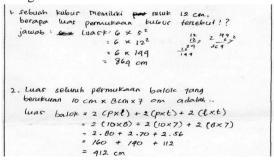


Figure 6. The result of creative thinking in problem posing test of students in level of creative thingking 1 part I

5. Sebuah luas selunih permukaan balok lang benukuran 6 cm x 12 cm x 8 cm adakh. luns balox : 2 (pxl) + 2 (pxt) + 2 (lxt) = 2(6×12)+2(6×8)+2(12×8) = 2.72 + 2.48 +2.96 199 + .96 + 192 290 + 192 432 an.

Figure 7. The result of creative thinking in problem posing test of students in level of creative thingking 1 part II

The results analysis of the student problem posing with the ability level of creative thinking 1 shows that student be able to fulfill only one of creative thinking indicators is fluency. Fulfilled the indicators of fluency because the student is able to possess at least three problems and able to solve the problem that has been made. In the Figure 6 and 7 show that student is able to possess problem three problems. On the indicator of flexibility, the student is not able to possess problem with many different solutions. The novelty indicator is not fulfilled because the student is not able to make a problem different from the problems it possess.

There are 10 of 21 student included into the level of creative thinking (LCT) 1. Such that the percentage of students in LCT 1 is 47.62%.

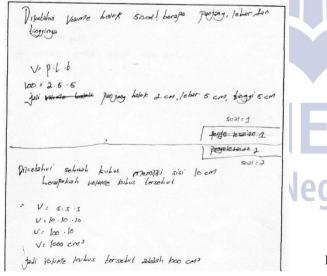


Figure 8. The result of creative thinking in problem posing

test of students in level of creative thingking 0

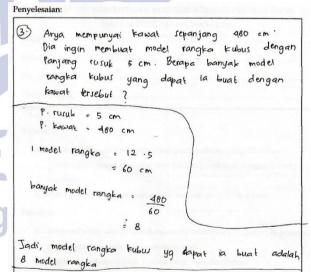
The results analysis of the student problem posing with the ability level of creative thinking 0 shows that student is not able to fulfill three of creative thinking indicators. Does not fulfilled the indicators of fluency because the student are not able to possess at least three problems and able to solve the problem that has been made. In the Figure 8 show that student are able to possess problem only two problems. On the indicator of flexibility, the student are not able to possess problem with many different solutions. The novelty indicator is not fulfilled because the student are not able to make a problem different from the problems it possess.

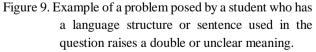
There are 4 of 21 students included into the level of creative thinking (LCT) 0. Such that the percentage of students in LCT 0 is 19.05%.

Based on the data of the quality of the student's problem assessed based on 5 indicators that are whether the problem can be solved, the corresponding of the problem with the material, the solving of problem, the structure of the sentence language and the difficulty level of the problem shows that 5 students make a problem with very good quality, 10 students make a problem with good quality, and 6 students make a problem with good enough quality.

Overall the problem made by the students fulfill the three indicators are whether the problem can be solved, the corresponding of the problem with the material, and the solving of problem.

In the structure of the sentence language of the problem, there are some problem which have the structure of the language or sentence used in the matter of giving rise to a double or unclear meaning. Here is an example of a problem posed by a student who has a language structure or sentence used in the question raises a double or unclear meaning.





On the difficulty level of the problem, there are some problems that students have proposed to solve directly using the existing data so as not to meet this aspect. Here is an example of a problem that the student submits with a direct solution using existing data.

berapa luas	memiliki por rusuk permukaan kubur	12 cm, terrebut ! ?
jawab : <del>Gex</del>	Luast: $G \neq 5^2$ = $6 \times 12^2$	12 2 149 2 12, 2 49 2 12, 369
	= 6 x 199 = 869 cm	199

Figure 10. Example of a problem that the student submits with a direct solution using existing data

### CONCLUSION

Based on the result of this research, we have conclusions as follows.

- Teacher's ability to manage learning is on excellent and good criteria with score 4 and 3.
- 2. Subjects is on the criteria active during learning time, with the percentage of 56.4%.
- 3. Students' response to the learning that has been implemented is positive.
- Students in level of creative thinking (LCT) 4 level is 9,52%, in level of creative thinking (LCT) 3 is 19,05%, in level of creative thinking (LCT) 2 is 4,76%, in level of creative thinking (LCT) 1 is 47,62%, and in level of creative thinking (LCT) 0 is 19,05%.
- 5. Quality of students' problems in excellent category is 23,8%, in good category is 47,6% and in good enough quality is 28,6%.

#### Suggestion

Based on the result of this research, we have suggestion as follows.

- 1. Based on the results of the questionnaire of the students' response to problem posing-geogebra learning method to improve students' creative thinking ability as a whole to get a positive response. This is indicated by the percentage of each grain of the response statement more than 50%. So, problem posing-geogebra learning method to improve students' creative thinking ability can be applied to the learning of mathematics and can be continuously improving students' creative thinking ability.
- 2. In this research there is no data of creative thinking ability of students before applying learning of problem-geogebra. Such that, results of this study can not be a benchmark of the results of the exercise for researchers who will conduct similar research.

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