EFFECTIVITY OF PEER TUTORING LEARNING TO INCREASE MATHEMATICAL CREATIVE THINKING ABILITY OF CLASS XI IPA SMAN 3 KENDARI 2014

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Abstract

This study aims to assess : (1) an increase in the ability to think creatively mathematics students after being taught by using peer tutoring learning approach, (2) an increase in the ability to think creatively mathematics students after being taught with hands-on learning approach, (3) the difference increased ability to think creatively mathematical between students taught using peer tutoring and learning approaches of students taught using hands-on learning approach . The population in this study were all students of class XI IPA at SMAN 3 Kendari. From the results of data analysis and discussion is concluded. First : There is an increased ability to think creatively mathematical significant student learning in the classroom using peer tutoring learning approach. Secondly : There is an increased ability to think creatively significant mathematical students in the class are learning to use hands-on learning approach. Third : The ability to think creatively mathematics students taught using peer tutoring learning approach significantly better improvement of students ability to think creatively mathematical taught using hands-on learning approach .

Keywords : Peer tutoring, Creative Thinking Skills Mathematics.

INTRODUCTION

One aspect that needs to be improved in national education vision is creativity. Creativity is basically includes the ability to create new combinations , or see new relationships between elements or things preexisting (Semiawan, 1987:8). So creativity lies in the ability to look at the association between objects beforehand, so as to create something new or provide new ideas that can be applied to solving the problem. Comprehensively, creativity can be defined as the ability to think, act, and act on a new way and unusual, which is used to solve a variety of problems that can solve the problems with the completion of the original and useful. Therefore, creative thinking skills should be developed, not least during the learning of mathematics.

As a first step to foster creative thinking skills that need to be considered is the mathematical learning process . In this cas, the teacher has a very big role to achieve a good learning process. One of the main tasks of teachers in mathematics learning activities in schools is creating a learning environment that can hone creative activity, to motivate students to continue to study well and excited, because the learning environment such as this will have a positive impact in improving students' ability to think creatively mathematical. To that end, the teacher should have the ability to choose at once using appropriate teaching methods that can generate creative mathematical thinking ability of students.

According Munandar (Risnanosanti, 2010:3), the optimal development of creative thinking ability is closely related to the way teachers teach . Creative thinking abilities will grow well if students learn on their own initiative, given the confidence to think and dare to put forward new ideas. Opinions about creative thinking abilities indicate that the ability of creative thinking in growing can developed through a teacher designed learning so can train students to explore all the ability that was in him.

Based on the above development strategy creativity, students need encouragement to realize their creative potential, students should be given the opportunity to be actively involved in the process of creative problem solving and fun. Therefore, teachers should facilitate a learning can help students to cultivate and train the ability to think creatively. One of the suspected learning approach can be applied in the study of mathematics and allows the realization of the expected learning activities is to use peer tutoring learning approach.

According to Zaini (Herianto , 2010: 5), the best method of learning is to teach it to others. Peer tutoring approach is an approach to learning in which the learning activities are the students themselves to take advantage of students who have privileges in the classroom to help provide explanations, guidance and direction to students who have low ability. Students designated as a tutor, was assigned to help students who have difficulty in accepting the material provided by the teacher. To improve students' ability to think creatively mathematical using peer tutoring learning approach, the ability to think creatively in a group is very dependent on the readiness of a tutor.

Based on interviews and preliminary observations made by researchers at SMAN 3 Kendari in grade XI, on February 18, 2013 that the information obtained in carrying out learning activities, particularly in mathematics, teachers tend to procedural and more emphasis on learning outcomes. "Procedural" the authors mean is a way of teaching that begins with : (1) describe the subject matter, (2) gives examples of questions, (3) provides the opportunity for students to ask questions, (4) provide exercises to students, and (5) asked one of the students to write down the results of their work to the class. While the intent of "more emphasis on learning outcomes" is in the learning activities, teachers rarely and never even touched and train creative mathematical thinking skills of students, such as train students to think about the questions that lead to a number of alternative answers in solving. Exercises are usually given to the student teacher is the practice questions in the solution only refers to one answer and direct the use of existing formula or unseen.

Learning activities like these, it is easy for teachers to implement. But, do not always succeed in mathematics, is characterized by low average math scores of students in the second semester of the 2012/2013 academic year class X (source of Teachers of Mathematics). So that researchers consider the need for an alternative learning models that correspond to particular mathematical material limit function, considering the limit of this function is one of the subject matter of mathematics that have diverse settlement so as to improve students' ability to think creatively math when adjusted to appropriate learning models.

Therefore, researchers choose learning with peer tutoring approach, because the approach of peer tutors, students who serve as tutors in the group can give directions that help other students in understanding the lessons that can further enhance creative thinking abilities of each student.

Based on the above problems, the authors conducted a study titled "Effectivity Of Peer Tutoring Learning To Increase Mathematical Creative Thinking Ability (Experimental Study In Class XI students of SMAN 3 Kendari".

From the description above background, the problem is limited research on improving the ability to think creatively mathematical covering smoothness, flexibility, authenticity, and of detail (elaboration) using peer tutoring learning approach where students can play a role became a teacher in a group that helps students to be able to more easily interact with the direct learning approach, namely the learning process is generally carried out by teachers to students in grade XI SMA semester 3 Kendari .

Based on the description in the background, the problem in this study are :
1.   Is there an increase in students' ability to think creatively mathematics as taught using peer tutoring learning approach ?
2.   Is there an increase in students' ability to think creatively mathematics as taught using direct instruction ?
3.   Are there differences in the ability to think creatively increase significantly math students taught using learning approaches peer tutors and students are taught using hands-on learning approach ?

In accordance with the formulation of the problem that has been stated above, the study aims to:
1.   To assess the descriptive and inferential increase students' ability to think creatively mathematics as taught using peer tutoring learning approach.

2. To examine the descriptive and inferential increase students' ability to think creatively mathematics as taught using direct instruction.
3. To assess descriptive and inferential difference increased ability to think creatively significantly math students taught using learning approaches peer tutors and students are taught using hands-on learning approach.

   The results of this study can be useful for teachers, students, researchers, and institutions.
1. For the teacher : can be an alternative learning model that can be applied to enhance the students' ability to think creatively mathematics.
2. For students : get the opportunity to learn mathematics with different shades and fun and can improve students' ability to think creatively mathematical.
3. For researchers : it can be a means for self-development researchers and can be used as a reference / reference for other researchers and in other similar studies, especially in mathematics.
4. In addition a reference for students who want to do research related to the ability of creative thinking and learning mathematics with peer tutoring approach .

   Some education experts give different definitions of learning but in principle have the same purpose, as stated by Muhibbin (2007:90) in his book Psychology of Education with New Approach believes that learning is a change that occurs within the organism (human or animal) is caused by experience that can affect the behavior of the organism. Jafar (2008:3) also believes that learning is a cognitive process that changes the nature of environmental stimuli into several stages of information processing required to acquire new capabilities. Similarly, Sudjana (2000:29) argues that the essence of teaching is a process, which is the process of arranging, organizing existing environment around students so as to cause and encourage student learning process.

   Mathematics is essentially a way of reasoning deductive science. Deductive reasoning is the process of making conclusions based on the premises that the truth has been determined. Deductively, mathematics discover new knowledge based on certain premises (Hudojo, 2005:35). Freudental in Soewandy (2005 : 24) states that mathematics is a human activity. Matematisi discover mathematical concepts by doing , to reflect on the action (activity) and then find the results in the form of concepts, properties of concepts , relationships between concepts, rules, and principles of the construct. According Suherman (2003 : 15), mathematics is the language of symbols, numerical language, a language which can eliminate blur nature, logical thinking method, a means of thinking, logic adults, and at the same means servant, science regarding the quantity and magnitude, science works draw conclusions, a purely formal science, the science of numbers and space, studying the pattern (relationship, shape, and structure), abstract and deductive science, and human activities.

   According Syarifuddin in Soewandy (2005:25), mathematics learning is a process that deliberately designed with the aim of creating an atmosphere allows one (the student) conducting study mathematics, and the process is centered on the teacher. In mathematics teaching students should be given the opportunity to note construct knowledge through doing, observing, classifying, solve problems, communicate, interact or negotiate with others, including the teacher to reflect, estimate, or prediction infer, investigating relationships, linkages, and so on.

   The experts have a wide variety of views related to creativity. This suggests that creativity is a complex study. Therefore, there is no one that can be used as a raw deal in the standard measure of creativity. As it is expressed by Supriya (Ismaimuza, 2010: 23), there is no sense of creativity which can represent a diverse understanding of creativity. Furthermore Lambertus (2010 : 23), explicitly said that until now there is no standard definition of creativity, so as to study it needs to look at the definition of the theory on which the reference.

   Kiesswetter stated that the ability to think flexibly, which is one aspect of the ability to think creatively, an important capability that must be owned by the students in solving mathematical problems. This opinion confirms the existence of mathematical creative thinking skills. Furthermore, Krutetski define the solution of mathematical problems are easy and flexible (Mahmudi, 2010: 3). Creativity can be seen as products of human thought or behavior and as a process of thinking about the ideas in the face of an issue or

problem. Creativity can also be viewed as a process of playing with ideas or elements you have in mind, so it is a challenging activities for students who are creative (Semiawan, Ismaimuza, 2010:24).

Creative thinking is also defined as the ability to think someone in developing ideas or ideas that are smooth (fluency), flexible (flexibility), original (originality) and elaborative (elaborate) (Awaludin, 2008:66). Munandar (1992 : 21) gives the sense that the creative thinking as a way of thinking that allows the answer to an issue not just one. In the creative learning process, according Semiawan (1990 : 33) used divergent thinking (thinking process control every aspect of direction and produce many kinds of alternative settlement). This is in accordance with the opinion Munandar (1992 : 21) who say, that for divergent thinking requires the ability to think creatively.

Martin (Mahmudi, 2010:2), presents three aspects of the measurement of the ability to think creatively, namely productivity, originality or authenticity, and versatility or flexibility. Productivity relates to the number of works produced. Originality associated with a work that is different from the results of similar works in the vicinity. Flexibility refers to the willingness to modify beliefs based on new information. Someone who does not think flexible is not easy to change ideas or their views even though he knows there is a contradiction between the idea of which is owned by a new idea.

While to classify the ability to think creatively, used Tapilouw criteria below.

Value	Category
$0 < x \leq 20$	Very Low
$20 < x \leq 40$	Low
$40 < x \leq 60$	Moderate
$60 < x \leq 80$	High
$80 < x \leq 100$	Very High

(Tapilouw in Mulyana , 2005)

In this study, the ability to think creatively is concluded as a process of constructing an idea which is then measured by using open questions (open-ended), which is based on indicators of creative behavior, ie fluency/smoothness, flexibility, decomposition/of detail (elaboration), and original.

Effectivity is a condition that indicates the extent of what was planned to be achieved. The more plans that can be achieved, the more effective the activity. In other words, the effectivity of the mean level of success.

According to Popham (2003 :7) teaching effectivity should be reviewed from a particular teacher relationships that teach specific groups of students, in certain situations in achieving specific instructional objectives. Furthermore Dunne (1996 :12) adds that the effectivity of learning has two characteristics. The first characteristic is to "facilitate student learning" something "useful", such as the fact the skills, values, concepts and how to live in harmony with each other, or something desired learning outcomes. The second characteristic, that their skills are recognized by the competent judge, such as teachers, teacher trainers, supervisors, tutors and subject guides or students themselves. Furthermore, the concept of teaching effectivity is associated with the role of the teacher as the manager of the teaching-learning process, acting as a facilitator who seek to create conditions for effective teaching and learning so as to enable the process of learning, develop good study materials, and improve the ability of students to listen to the lessons and master pur- their educational goals that must be achieved through a learning process (Usman , 2000:2).

Eggen and Kauchak suggests that effective learning when students are actively involved in the organization and determination of information (knowledge). Students do not just passively accept the teacher's knowledge, the results of this study not only enhance students 'understanding, but also improve students' thinking skills. The effectivity of learning in question here is the extent to which the learning of mathematics succeeded in making students achieve the learning objectives that can be seen from the mastery learning.

Tutorial program is essentially the same as the guidance program, which aims to provide assistance to students or learners in order to achieve optimal learning outcomes. Hamalik stated tutorial is learning guidance in the form of guidance, assistance, guidance, direction, and motivation of the students to learn efficiently and effectively (Hamalik , 1990: 73).

In line with the above description, Arikunto (1986: 62) argues that in choosing a tutor to consider the following matters; (1) Tutor can be accepted (approved) by the students who received the improvement program so that students do not have fear or reluctance to ask him; (2) Tutor can explain repair materials needed by students who receive program improvement; (3) Tutor haughty, cruel or hard-hearted toward their fellow, and (4) Tutors have enough creativity to provide guidance, which can explain the lesson to his friend.

Semiawan in Suherman et al (2003: 276) suggests that peer tutors are students who are good at providing learning assistance to students who are less intelligent. Given that the student is an essential element in the teaching, which in turn can change the behavior as expected. To that end, the student must be a consideration in the selection of the source of teaching resources.

Stages of learning activities in the classroom by using a Peer Tutor approach is as follows:

Preparation phase
- Teachers make learning programs that are designed in several indicators.
- Teachers conduct initial tests to determine some of those students who meet the criteria as a peer tutor. Designated number of peer tutoring tailored to the number of groups formed.
- Teachers held training for tutors. In the implementation of this tutorial or guidance, students become tutors act as teachers. So exercises held by a kind of teacher education teacher or the student. Exercise is held in a way that is through small group exercises in which case only the students who get exercise which will be tutors.
- Teachers classify students into small groups consisting of 4-5 people. This group is based on variations in the level of intelligence of students. Then the peer tutors who have been appointed in the scatterplot in each group have been determined.

Implementation phase
- Each teacher conferences provide an explanation in advance of the material is taught.
- Students learn in their own group. Tutor asked members of the group in turn will be the things that have not been understood, especially in terms of how to solve the problems in LKS. If there is a problem that is not solved in the group then ask for help teacher tutors.
- Teachers supervise the learning process, teachers move from one group to another to provide assistance if there is a problem that can not be resolved within the group. (Arikunto, 1986: 66)

Peer tutoring approach has benefits both in terms of students who serve as tutors and for students who are taught. For a tutor to guide or teach a topic or concept to his friend, the understanding of the material that will be deeper and will gain experience. This helps to reinforce what they have learned and gained over the responsibilities assigned to them, while students will be guided to understand because the language is understood by his students. This is reinforced by the opinions Arikunto (1986: 64), which states there are some benefits of peer tutoring approach, namely: the results will be better, especially for some of the children who have feelings of fear or embarrassment to the teacher. As for tutors, tutoring jobs will reinforce the concepts being discussed, it is as if he is reviewing and memorizing it back. For tutors, an opportunity to train themselves hold responsibility in carrying out the duties and exercise patience. Strengthen the relationship between students and strengthen the social feeling.

According Pangaribuan (1997:75), direct learning is learning which is implemented based on habit, or in other words that are commonly used teacher learning everyday. In using such a model of learning, the teacher usually use expository method (lecture vary) so that learning also called ordinary, traditional or classical.

In this study the direct learning which is also used by teachers is expository. expository learning is a learning that begins with the teacher conveys information about the material to be learned, which is first processed completely by the teacher before being submitted to the students. After delivering course material students ask the things that have not been understood and explained again by the teacher. Forwarded by giving examples of problems. Then given the problems of the exercise conducted by the students with refard examples of problems that have been done previously.

The steps are performed in the approach with the method according Rusyan expositors (1989: 178) are as follows:
1. It should be known and clearly defined goals materipelajaran delivery.

2. The material must be structured such that it can be understood clearly and attract the attention of students.
3. Delivering the information / material to students.
4. Frequently asked questions about things that are not understood by the students.
5. Give examples of problems.
6. Students record things that are considered necessary.
7. Teachers provide practice questions and carried out by the student in accordance with examples of problems.

RESEARCH METHODS

This study was carried on in SMAN 3 Kendari. Time implementation is done in the second semester of the school year 2013/2014. Pretest data collection phase, the experimental class was held on April 23, 2014, while in the control class held 24 April 2014. Study conducted for six sessions in each class. Posttest data collection phase, the experimental class was held on May 30, 2014, while the control class held on May 29, 2014.

The population of this experiment is the whole class XI IPA at SMAN 3 Kendari scattered to the four class XI IPA 1 and XI IPA 4. Sampling in this study conducted by purposive sampling, with design considerations take two classes that have the capability of relatively the same. Of how the obtained grade XI and XI IPA 3 4. Determination of the class will be taught by TPS learning model and conventional learning is then performed by simple random sampling. From this sampling technique, then obtained a class XI IPA 3 as the experimental class and class XI IPA 4 as a control.

The independent variable in the form of learning treatment with peer tutoring approach (X1-) and control of the application of mathematics instruction using direct instruction (X2). The dependent variable in the form of creative thinking ability of students after the application of learning math mathematics using peer tutoring approach (Y1) and creative thinking skills of mathematics students after the application of mathematical learning using direct instruction (Y2).

The research design used in this study was pretest-posttest control group design, which is an experimental design involving two groups, with both groups selected according to the required criteria. Design / study design of this type is described as follows:

R	O_1	X	O_2	(eksperimental group)
R	O_3		O_4	(control group)

(Setyosari,2012:180)

Specification:
R: random
X: treatment
O1: pretest experimental class
O2: posttest experimental class
O3: pretest control class
O4: class posttest control

Data from this study were obtained from the two instruments, the instruments in the form of tests to measure students' ability to think creatively mathematics and instruments such as the observation sheet / observations are used to measure the sustainability of learning with tutor approach. Instruments creative thinking skills of mathematic students prior trials conducted about the instrument.

This experimental study using two techniques of data analysis is descriptive analysis and descriptive inferensial. Statistik used to describe the research data in the form of acquisition of an average score ($\bar{x}$), median (Me), modus (Mo), maximum value (x_{max}), minimum value (x_{min}), standard deviation (s) dan varians (s^2) and create a frequency distribution and relative frequency distribution (Sudjana, 2005: 46-53) and classification Normalized Gain mathematical communication skills of students.

The data will be analyzed in this study of the pretest and posttest scores mathematical communication skills of students, converted into a value of N-Gain (gain normalized), by the equation:

$$N - Gain = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}}$$

Spesification : S_{post} = *Posttest scor*,
                 S_{pre} = *Pretest scor*, and
                 S_{max} = The maximum score that may be obtained by students.

Table 1

Criteria Gain normalized (*N-Gain*)

Acquisition N_{Gain}	Criteria
$N_{Gain} > 0{,}70$	**High**
$0{,}30 \leq N_{Gain} \leq 0{,}70$	**Moderate**
$N_{Gain} < 0{,}30$	**Low**

(Archambault in Duda, 2010:32).

Normality test data is intended to determine whether the data obtained from the population that is normally distributed or not. For this purpose, the statistic used is the Kolmogorov-Smirnov test.
     The steps required in this test are as follows:
1) Data observations Y are sorted from smallest data to the largest data,
2) Determination of the relative cumulative frequency distribution of each variable data has been sorted and given the symbol Fa (Y),
3) Calculate the value of Z by the formula:

$$Z = \frac{Y - \mu}{\sigma}$$

Spesification :

     μ = the average score (used $\overline{Y}$)
     σ = standard deviation (used S_x)

4) Determination of the theoretical cumulative frequency distribution (area under the normal curve) of the variable Y is denoted Fe (Y),
5) Determine the absolute value of the difference Fa (Y) and Fe (Y), namely:

$$\left| Fa(Y) - Fe(Y) \right|$$

6) Comparing D_{maks} = maks $\left| Fa(Y) - Fe(Y) \right|$ with the value of the standard error D_{tabel} $\alpha = 0.05$.

7) The criteria for decision-making are:
     a) If $D_{maks} \leq D_{tabel}$ then the data is derived from normally distributed populations
     b) If $D_{maks} > D_{tabel}$ then the data derived from populations that are not normally distributed (Djarwanto, 1995: 50).

Couple hypothesis:

H_0: Samples come from populations with normal distribution

H_1: The sample comes from a population distribution is not normal

Homogeneity test data is intended to determine whether the data variance both groups studied have homogeneous variances or not. Testing homogeneity of variance carried out by F-test with the following formula.

$$F_{hit} = \frac{greatest\ variance}{smallest\ variance}$$

In this case the applicable provisions, if the price of the F count is less than or equal to F table (($F_{hit} \leq F_{tabel}$), then Ho is accepted and H1 rejected ($F_{hit} > F_{tabel}$). Ho acceptable means homogeneous variance (Sugiyono, 2013: 140).

Couple hypothesis:

$H_0 : \sigma_1^2 = \sigma_2^2$

$H_1 : \sigma_1^2 \neq \sigma_2^2$

Spesification :

H_0 = Both data sets homogeneous variance for the population variance

H_1 = Both sets of data are not homogeneous variance of the population variance

To test the difference in average grade student mathematical communication skills experimental and control classes, used the average difference test or t-test. Because the data in this study with normal distribution and variance homogeneity, then the hypothesis testing used two different test average or statistical t-test with t-test formula used is:

$$t_{arithmetic} = \frac{\bar{X}_1 - \bar{X}_2}{S_{gab}\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$ (Sudjana, 2005: 239)

$$with\ S_{gab} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

Spesification :

$\overline{X_1}$ = The mean gain experimental class

$\overline{X_2}$ = The mean gain control class

S_1^2 = variants of experimental class

S_2^2 = variants of control class

n_1 = many subjects experimental class

n_2 = many subjects control class.

With the testing criteria: thank H_0 if $t < t_{1-\alpha\ (tabel)}$, where $t_{1-\alpha}$ was obtained from the t distribution list with dk = ($n_1 + n_2 - 2$). For prices of other t H_0 is rejected (Sudjana, 2005: 243).

Couple hypothesis:

$H_0: \mu_1 = \mu_2$ lawan $H_1: \mu_1 > \mu_2$

Specification:

μ1 = parameter mean experimental group

μ2 = parameter control group mean.

The hypothesis proposed:

H_0 = Creative mathematical thinking skills of students who are taught by tutors learning approach significantly similar to the mathematical creative thinking ability of students who use hands-on learning approach.

H_1 = Creative mathematical thinking ability of students taught using peer tutoring learning approach significantly better improvement of creative mathematical thinking skilla students use hands-on learning approach.

THE RESULTS

The results of the analysis based on testing the validity of the instrument tests students' ability to think creatively mathematical consisting of 7 items pretest given to 40 students and 7 items posttest given to 40 students. The following are the results of the analysis of the validity of the test's ability to think creatively mathematical displayed in Table 2 and 3.

Table 2
Validity Analysis of Mathematical Ability Test of Creative Thinking (pretest)

Numbers Matter	Correlation Coefficient (r_{xy})	interpretation of Correlation	Spesification
1	0,395	Low	Valid
2	0,361	Low	Valid
3	0,629	High	Valid
4	0,555	Enough	Valid
5	0,432	Enough	Valid
6	0,130	Very low	Invalid
7	0,355	Low	Valid

Source: Primary Data Processed With Microsoft Excel 2007

Based on Table 4.1 was obtained 1 items are not valid and invalid item 6, the sixth item is a matter of numbers 1,2,3,4,5 and 7.

The results of reliability analysis test students' ability to think creatively mathematical (pretest) shown in Table 4.2 below:

Table 3
Reliability Analysis Results of Mathematical Ability Test of Creative Thinking (pretest)

$\sum \sigma_i^2$	**7.11**
σ_t^2	**24.97**
r_{11}	**0.83**

Based on the above table 3 obtained value test reliability coefficient = 0.83 which can be interpreted in the category of high reliability. This means that the test is reliable enough to measure students' ability to think creatively mathematical.

Table 4
Validity Analysis of Mathematical Ability Test of Creative Thinking (posttest)

Numbers Matter	Correlation Coefficient (r_{xy})	interpretation of Correlation	Spesification
1	0,382	Low	Valid
2	0,195	Very low	Invalid
3	0,465	Enough	Valid
4	0,802	High	Valid
5	0,545	Enough	Valid
6	0,777	High	Valid
7	0,721	High	Valid

Source: Primary Data Processed With Microsoft Excel 2007

Based on Table 4 obtained 1 items are not valid and invalid item 6, the sixth item is a matter of numbers 1,3,4,5,6 and 7.
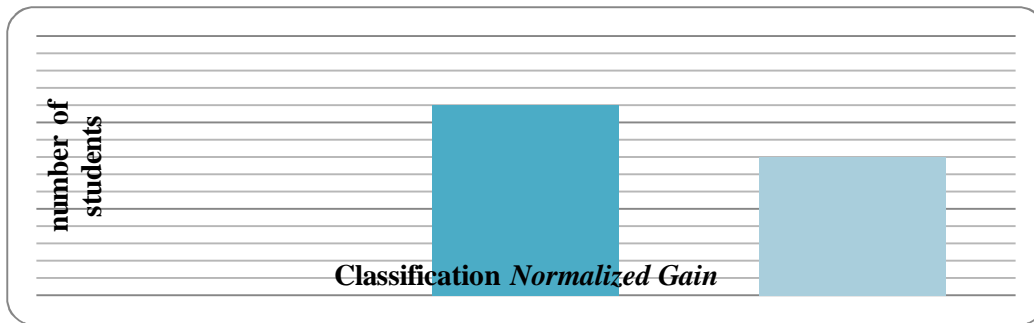
The results of reliability analysis test students' ability to think creatively mathematical (posttes) shown in Table 5 below:

Table 5
Reliability Analysis Results of Mathematical Ability Test of
Creative Thinking (posttest)

$\sum \sigma_i^2$	**12.27**
σ_t^2	**24.97**
r_{11}	**0.59**

Based on the table above 5 reliability coefficient values obtained test = 0.59 which can be interpreted in the category of moderate reliability. This means that the test is reliable enough to measure students' ability to think creatively mathematical.

Normalized value of the gain in the experimental class is almost evenly on the classification of the "being" that is in the interval $0,30 \leq G \leq 0,70$ the number of students 11 people and classification of "high" that is in the interval $G > 0,70$ the number of students 8 people. The mean normalized gain obtained in the experimental class is 0.67 so it has classified as "moderate" with the largest normalizedgain value of 0.92 and the smallest gain normalized value of 0.40.

Picture 1. Histograms and Frequency Polygons Data Claryfing Normalized Gain to Think Creatively Grade Math Experiment

To increase each indicator of the ability to think creatively mathematical presented in Table 6 below :

Table 6
Upgrades Creative Thinking Mathematics Classroom Experiment

Indicator	Average *Pretest*	Average *Posttest*	Enhancement	Percentage
Fluency	2.68	3.29	0.61	15.13%
Flexibility	2.24	3.76	1.53	38.16%
Originality	1.58	2.84	1.26	31.58%
Elaboration	2.47	3.32	0.84	21.05%
Average	2.24	3.30	1.06	26.48%

From the table shows the percentage increase in the ability to think creatively experiment class mathematical fluency indicator of 15.13%, amounting to 38.16% flexibility, originality of 31.58%, and the elaboration of 21.05% with an average percentage increase of 26.48%. There is a rapid increase in the flexibility indicator danoriginality with an increase of 38.16% and 31.58%.

Normalized value of the gain in the control classes are most numerous in the classification of "being" that is in the interval $0.30 \leq G \leq 0.70$ by the number of students 16 people with a percentage of 72.73%. The mean normalized gain obtained in the control class is 0.42, with the largest gain normal value of 0.70 and the smallest gain normalized value of 0.20.
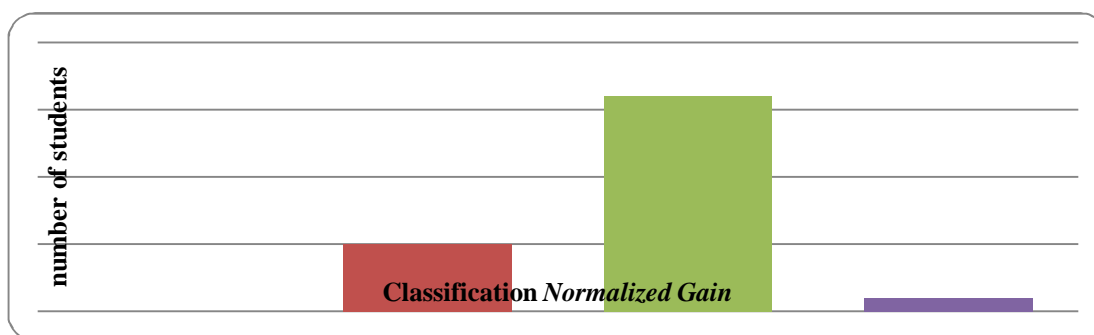

Figure 2. Histogram and Frequency Polygons Data Classification Normalized Gain Creative Thinking Skills Mathematics Grade Control

To increase each indicator of the ability to think creatively mathematics in grade control are presented in Table 7 below :

Table 7
Upgrades Creative Thinking Mathematics Classroom Control

Indikator	Average *Pretest*	Average *Posttest*	Enhancement	Percentage
Fluency	2.00	2.84	0.84	21.02%
Flexibility	2.64	3.34	0.70	17.61%
Originality	1.45	2.14	0.68	17.05%
Elaboration	2.45	2.95	0.50	12.50%
Rata-rata	2.14	2.82	0.68	17.05

From the table shows the percentage increase in the ability to think creatively mathematical fluency control class indicator of 21.02%, 17.61% flexibility of, originality of 17.05%, 12.50% danelaboration . with an average percentage increase of 17.05%. There is a rapid increase in the flexibility indicator danoriginality with an increase of 17.61% and 17.05% .

Table 8
Descriptive statistics of Mathematical Creative Thinking Ability
Experiment Class and Class Controls

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
N_Gain_eksperimen	19	.40	.92	12.73	.6700	.14636	.021	.026	.524	-.698	1.014
N_Gain_kontrol	22	.20	.70	9.19	.4177	.14336	.021	.096	.491	-.837	.953
Valid N (listwise)	19										

Source : Primary Data Processed With SPSS / PC Ver . 17

Based on the results of the descriptive analysis of mathematical creative thinking skills in the experimental class earned an average value gain0,67 (rounding to two decimal places) with a standard deviation of 0.14636. As for the class gained control of the average value of 0.41 (rounding to two decimal places) with a standard deviation of 0,14636. The average value of the gain obtained in the two groups showed that the 0.67 value represents the value gain19 students the experimental class and the value of 0.41 represents a value gain22 students in the control class. Minimum Gain experimental class that is 0.40 and the mximum gain value of 0.92. As for the class controls the gain minimum value of 0.20 and a maximum gain value of 0.70 .

Table 9
Results of Statistical Analysis Normality Test Data N - Gain
Creative Thinking Ability in the Second Grade Math Students

One-Sample Kolmogorov-Smirnov Test

		n_gain_eksperimen	n_gain_kontrol
N		19	22
Normal Parameters[a,,b]	Mean	.6700	.4177
	Std. Deviation	.14636	.14336
Most Extreme Differences	Absolute	.160	.130
	Positive	.160	.130
	Negative	-.129	-.112
Kolmogorov-Smirnov Z		.698	.610
Asymp. Sig. (2-tailed)		.714	.851

a. Test distribution is Normal.

Source : Primary Data Processed With SPSS / PC Ver . 17

In Table 9 above can be seen that the value Asymp. Sig . (2 - tailed) for the experimental class is $0.714 > 1/2 \, \alpha$ (with $\alpha = 0.05$), so that H0 is accepted. Thus, it can be concluded that the distribution of the data of N-Gain creative mathematical thinking skills of students in the experimental class normal distribution. As for the control class, it appears that the value Asymp. Sig. (2 - tailed) it is $0.851 > 1/2 \, \alpha$ (with $\alpha = 0.05$), so that H0 is accepted . Thus , it can be concluded that the distribution of the data of N - Gain creative mathematical thinking skills of students in the class are normally distributed control .

Table 10
Homogeneity Test Results of Statistical Analysis Data N-*Gain* Creative Thinking Skills Math Student

One-Sample Test

		Levene's Test for Equality of Variances	
		F	Sig.
n_gain	Equal variances assumed	.022	.884
	Equal variances not assumed		

Source : Primary Data Processed With SPSS / PC Ver . 17

From the table 4.11 above shows that the significant value of the test statistic is 0.884 levene . Significant value is greater than the significance level of 0.05 (sig . (0.005) $>\alpha = 0.05$) , then H0 is accepted so that it can be concluded that both groups have the same variance. This means that the distribution of the data of N-Gain both groups, who received peer tutoring learning approach and hands-on learning approach has the same variance (homogeneous) .

Table 11
Results of Statistical Analysis Differences Test average N-Gain (Test Enhancement) Creative Thinking Skills Math Students

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
N_Gain_Eksperimen	34.276	18	.000	.6382	.5005	.6595
N_Gain_Kontrol	18.546	21	.000	.4227	.3458	.4787

Source : Primary Data Processed With SPSS / PC Ver . 17

At 4.12 the table shows that the value of t in the experimental class is greater than the table value of t $_{(18 \, ; \, 0.05)}$ ($t_{hitung} = 34.27 > t_{table} = 1.734$), then H0 is rejected. Or to see half sig. 2 - tailed) in the experimental class is smaller than α ($\alpha = 0.05$) ($1/2$ sig . 2 - tailed $= 0.00 < \alpha = 0.05$) , so that H0 is rejected. Similarly, the control class is seen that the value of t in the control class is greater than the table value of t $table_{(21 \, ; \, 0.05)}$ ($t_{hitung} = 18.54 > t_{table} = 1.721$), then H0 is rejected. Or by looking at the value of half the sig . (2 - tailed) is smaller than α ($\alpha = 0.05$) ($1/2$ sig . 2 - tailed $= 0.00 < \alpha = 0.05$), so that H0 is rejected.

Table 12
Results of Statistical Analysis Differences Test of Creative Thinking Skills Improvement Mathematics Grade
Experiment and Control

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | 95% Confidence Interval of the Difference | |
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
N_gain	Equal variances assumed	.022	.884	5.565	39	.000	.25227	.04533	.16057	.34397
	Equal variances not assumed			5.556	37.890	.000	.25227	.04541	.16035	.34420

Source: Primary Data Processed With SPSS / PC Ver . 17

At 4.13 the table shows that the value of t is greater than t table $_{(39\,;\,0.05)}$ ($t_{hitung} = 5.565 > t_{table} = 1.681$), then H0 is rejected. Or by looking at the value of half the sig . (2 - tailed) is smaller than α (α = 0.05) (1/2 sig . 2 - tailed = 0.00 < α = 0.05), so that H0 is rejected.

DISCUSSION

The fundamental factors that make it hard to develop creative thinking skills in mathematics are now learning methods that do not provide space for students to be able to learn based on their own initiative , given the confidence to be able to think and dare to find new ideas for the students individually or with friends or groups. Therefore, teachers need to develop an appropriate learning approach that many members of space to the students so that they can be more creative , more independent and can be more communicative to find new ideas that can improve the mathematics learning, ie learning approaches peer tutoring.

Data creative mathematical thinking skills obtained through tests of creative thinking skills of mathematics (KBKM). The test is given to students in grade experimental and control classes , before treatment (pretest) and after treatment (posttest) . After learning in the classroom experiments conducted using a learning approach sebayadan tutor in class learning control using a direct approach , the data obtained N - Gain which is the difference between pretest to posttest creative mathematical thinking ability of students divided by the maximum score with preetest difference.

The average N - Gain obtained a picture of mathematical creative thinking abilities increase student who gets peer tutoring and learning approach that gets hands-on learning approach . Based on the analysis of the average difference test N - Gain (increase test) students ' ability to think creatively mathematical experimental class and control class, there is an increase in students' ability to think creatively mathematical significant after being taught by peer tutoring learning approach in the experimental class, as well as taught by using direct instruction on classroom control.

In the experimental class earned an average value of N - gain of 0.67 which shows that the increase in students' ability to think creatively mathematical included in the medium category. In terms of standard deviation of 0.146 indicates that large deviations from the average data is very small class can be interpreted learning that takes place evenly to all students. It is also evident from the minimum value of the N - Gain is 0.40 and the maximum value of N - Gain 0.92, with a maximum difference of N and N - Gain - Gain minimum is 0.52 which is not too far away. Learning that takes place uniformly to all students in this study due to the distribution of heterogeneous groups that can encourage students to be able to build knowledge together in a group together and interpret what they find or they are discussed later in the group there is also

a peer tutor students who have a high ability and relatively the same that have absorption quick lesson that helps other students in the group to be able to more quickly understand the lesson. Thus according to the constructivist learning theory they are encouraged to bring a variety of perspectives on the material or the same problem, to then build a viewpoint or construct knowledge together.

While in the control class average values obtained N-Gain0,40 which shows that the increase in students' ability to think creatively mathematical included in the medium category. The standard deviation of the control class is larger than the experimental class is equal to 0.154 can be interpreted learning that takes less evenly distributed to all students when compared with in -class learning experiment. It is also evident from the minimum value of the N - Gain is 0.10 and the maximum value of N - gain difference of 0.70 with N - Gain - Gain maximum and minimum N is 0.60 which is greater when compared with in -class learning experiment. Less inequality in the knowledge that a student due to the learning process in the classroom teacher centeredatau control over teacher-centered.

To find the difference increased ability to think creatively mathematical between experimental class students who use peer tutors learning approach with control class that uses direct instruction approach hypothesis test average value of the N - Gain creative mathematical thinking skills in both classes by using a statistical sample t test independent. By first passing the prerequisite test is test data normality experimental class and grade control and homogeneity of variance test data in the two groups of samples. Based on test data normality using the Kolmogorov-Smirnov test to the data obtained mathematical ability to think creatively experimental class and control class normal distribution. Furthermore, based on the results of the data variance homogeneity test mathematical ability to think creatively experimental classes and control classes using Levenne test obtained that data is the ability to think creatively methematic both groups have homogeneous variance.

Based on the results of hypothesis testing average data is the ability to think creatively mathematical experimental class and control class, it appears that the average increase in the ability to think creatively experimental mathematics classes and control classes differ significantly. It is based on the results obtained t t test is greater than the value is greater than the value of the t table , which means that H0 is rejected. In other words, significantly average mathematical ability of creative thinking in the experimental group better improvement than the control group.

The indicators were tested in creative mathematical thinking skills consist of fluency, flexibility, originality, and elaboration. Based on the results obtained in the experimental class persantanse Fluency is an indicator with a low increase compared to the other indicators, this is due to the basic ability of students who are less so they have difficulty in providing concepts for a given subject matter and also because the method for this lesson performed less provide space for students to be creative in learning, especially learning in school. Flexibility the ability to generate answers in several ways while Originality is the ability to give birth to new ideas. The increase in both of these indicators is higher than the other two indicators.

Increased flexibility due to be given to the students' learning is learning with peer tutoring approach that gives freedom to the students to develop various means of solving problems with the help of peer tutors who have the ability to understand the subject better and faster. Many ways solving/troubleshooting newly acquired math students so as to enable the pupils to find ways which are most appropriately used to solve the problem mathematically certain contexts.

The amount of new information on how to solving mathematical problems that make students aware of the character of each way plus prior knowledge before it can encourage students to try to incorporate some of the ways that are more efficient in solving mathematical problems. This is consistent with the theory that learning Ausubel meaningful learning is a learning process in which any new information or knowledge associated with the structure of the sense or understanding of the students had previously. For example, the experimental class, there are students who already know the character of the direct substitution method usually applied to limit a simple algebraic function and when the students get a limit function is more complicated algebraic fractions in algebra, then these students will use factoring or multiplication root sekawanterlebih first to get results aljabar simple functions and can direct substitution. Merger ways of solving these problems will affect the increase in indicators originality.

If the note further, increase creative thinking mathematically in the group of students whose learning using peer tutoring approach, it can be concluded that an increase in the ability to think creatively on a high

classification is greater than the group of students whose learning hands-on learning approach. This is a very interesting findings and need serious attention. A substantial amount of this is a great potential still to be developed, with the hope that the class or school that has the ability to think creatively mathematical being, can be increased to high. In this regard, it can be said that peer tutoring learning approach has great potential to improve students' ability to think creatively mathematical XI Science High School in the material limit function. This will certainly have an impact on improving the quality of students' mathematics learning outcomes that are expected in education.

CONCLUSION

Based on the results of research and discussion, it can be deduced as follows :

1. There is an increased ability to think creatively mathematical significant student learning in the classroom using peer tutoring learning approach, with an average increase of 1.06 with flexibility as an indicator that experienced the greatest increase is 1.53.
2. There is an increased ability to think creatively significant mathematical students in the class are learning to use hands-on learning approach, with an average with fluency as an indicator that experienced the greatest increase is 0.84.
3. Ability to think creatively mathematics students taught using peer tutoring learning approach significantly better improvement of students' ability to think creatively mathematical taught using hands-on learning approach.

ADVICE

Based on the above conclusion, suggestions are given as follows:

1. Teachers can apply peer tutoring learning approach as an alternative learning approach to improve students' ability to think creatively mathematical subject matter limit function .
2. Learning Tool (RPP, teaching materials, worksheets, LP 1) and test students' ability to think creatively mathematical contained this study can be used as a reference for high school teachers to implement peer tutoring learning approach.
3. It should be conducted similar studies with other material scope wider to develop peer tutoring learning approach in an effort to improve the ability to think creatively mathematical and student learning outcomes, particularly in mathematics.

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