The Effectiveness Of Cooperative Learning Type Team Assisted Individualization Based On Constructivism Toward Ability To Think Mathematically Creative Of Student

Dwi Sulistyaningsih[1,a)], Venissa Dian Mawarsari[2)]

[1] *Mathematics Education, University of Muhammadiyah Semarang*

[a)]Corresponding author: dwisulis@unimus.ac.id

Abstract. Many students have difficulty and get low score in trigonometry. Some reason said this subject contains a lot of formulas and the teachers have not used the learning system that can make students more active. This study aims to determine the effectiveness of the implementation of cooperative learning type Team Assisted Individualization (TAI) based on constructivism towad students' ability to think trigonometry creatively. This study is an experimental study conducted at SMA Muhammadiyah 1 Semarang. Data collection technique is student activity observation and creative thinking ability tests of mathematical ability. The result shows classical completeness of creative thinking abilities of students reached 85.7%. Value of creative mathematical thinking skills (KBKM) was influenced by students' activity was 78.4% and the value of Mathematical Creative Thinking Skills test experimental class was better than the control class. It means that learning of mathematics trigonometry by applying the cooperative model type TAI constructivism based is more effective than learning by using conventional learning models.

INTRODUCTION

The learning result of Mathematics in Indonesia is very low, especially in Trigonometry. It can be seen from the Students' Mathematic Scores for Trigonometry in the National Exam that are very far from satisfactory. The bad habit of students who only memorize the Trigonometry formulas is one of the causes of the students' low scores in that material (Rusdi dkk. 2013).

An early observation on the senior high school students in Semarang shows that the students has an assumption that Mathematics is an uninteresting subject. The result of interviews with some mathematics teachers in Senior High Schools in Semarang shows is that trigonometry is a chapter where students always get scores under the Minimum Completeness Criterion (KKM).

The fact of this phenomenon is that the teacher does not apply a learning method that can make students active in constructing their knowledge. Furthermore, the learning method used doesn't sufficiently involves the students' active roles so that it hardly improve the mathematic creative thinking ability of the students. This condition is also supported by the students' condition itself, such as: the students could not answers some questions, give various interpretations on some case, find out some more comprehensive meanings toward some questions, and students organize creatively the available information using some particular strategies to find out some possibilities of solutions.

Such a fact needs the teacher's attention and creativity to use a learning method that can make students more active and also able to construct their thought, so they can get new ideas, thoughts, and also solutions to answer their problems. Constructivist-based learning ia a learning designed for students to be able to construct their thoughts. The theory of Constructivism states that learning, students should be given chances to formulate their own ideas, check new information with old rules, and then revise them in case that the rules are no more appropriate anymore and apply them in the learning either consciously or unconsciously (Triatno, 2009).

Learning using constructivist-based Team Assisted Individualization (TAI)-typed cooperative learning model is one of cooperative learning methods that can make students more active. According to Slavin (2010), in cooperative learning method, students is placed as subjects in the learning (student oriented). In the TAI-typed cooperative learning method, a smarter student is expected to be the tutor (peer tutor) individually of his/her friends

that has a low ability in understanding material. Therefore, in that group, there will be created the same understanding at the same level of knowledge about the material being learned.

A learning process using constructivist-based TAI-typed cooperative model is a learning method that is applied following through TAI steps and also it must contain important components of constructivism principles such as, situation, grouping, linking, asking, exhibition and reflection. This condition hopefully will make a learning process to be more effective. By using constructivist-based TAI-typed cooperative method, the teacher will create a learning process centered to the students, so it can increase the students' activities in the learning process and, as a result, it will increase also the ability of students' creative thinking in trigonometry.

RESEARCH METHOD

The type of this research is an experimental research, specifically quasi experimental type with nonequivalent control group design. The experimental subject is divided into two categories, such as control and experimental classes. In the control and experimental classes, they will get homogeneity test that aims to know the ability level of students from both of those classes. The class sampling is done using the random sampling system for the members of population are considered homogenous (Sugiyoko, 2009)

The analysis of the test items used is the tests of validity, reliability, difficulty level, and differentiating ability. The validity of the creative thinking ability test items is analyzed according to the product moment correlation formula (Arikunto, 2010). The reliability of the test instruments to know the constancy of test result. The reliability of the test instruments is calculated using the formula of Alpha (Arikunto, 2010), as below:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum \sigma_i^{\,2}}{\sigma_t^{\,2}}\right)$$

r_{11} is the reliability calculated. $\sum \sigma_i^{\,2}$ is each item of the score variant amount and $\sigma_t^{\,2}$ is the total variant. Test Difficulty Level (DL) is interpreted in index form (arifin, 2009)) as follow.

$$TK = \frac{N_{gagal}}{N} \times 100\%$$

N_{gagal} is the failed test and N is the amount of the total test. Discrimination index (D) is calculated using the following formula (Depdiknas, 2008)

$$D = \frac{Mean\ kelompok atas - Mean\ kelompok bawah}{Skor\ maksimum\ \ soal}$$

The student activeness observation result analysis uses scoring criterion contained of 5 scores, score 1, score 2, score 3, score 4, and score 5. Student activeness is calculated accordance of formula :

$$\text{Skor rata-rata} = \frac{Skor\ total}{Banyak\ butir\ pengamatan\ keaktifan\ siswa}$$

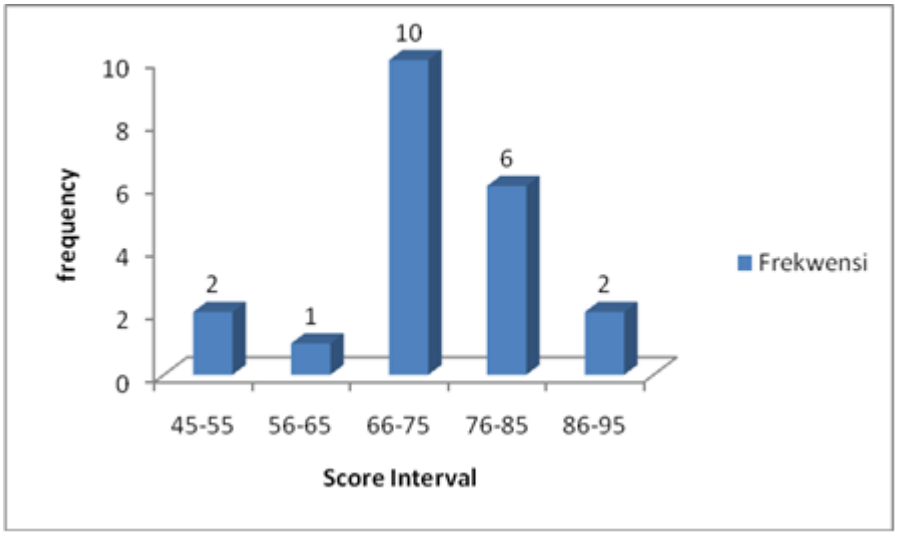
The data analysis on the effectiveness of the learning instruments includes of 3 tests, such as completeness test, influence test and comparison test. Individual completeness test is used to know whether the average ability of creative thinking in the experimental class for basic competency tested has reached the KKM score or not. The individual completeness is analyzed by one side average test using T test. On the other hand, the classical completeness uses one side proportion test. Free variable influence test of student activeness (X) toward bound variable of ability of creative thinking (Y) uses regression test with SPSS program. Comparison test is used to compare the average result of experimental class students' TKBK to the average result of control class students' TKBK. Variant similarity is tested first before choosing T formula. Comparison test analysis uses SPSS program.

The learning process can be said effective if the experimental class get a result according to three categories. First, student proportion must reach > KKM minimum score of 75%. Second, there is a positive influence of

activeness toward students' creative thinking ability. Third, TKBK average score of experimental class students is better than TKBK average of control class.

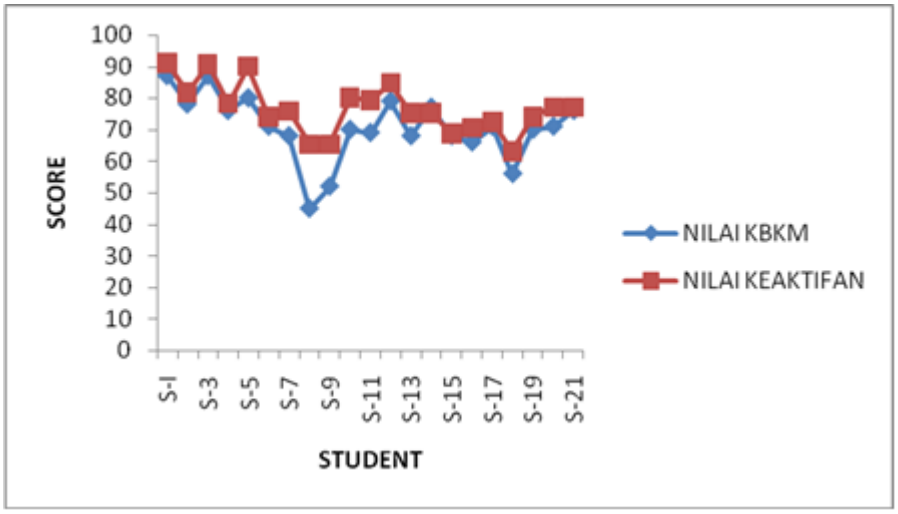
RESULT AND DISCUSSION

The test of learning instrument in the field shows that learning instrument produced have fulfilled effective criterion. Instrument effectiveness can be seen from the first individual completeness result according to the calculated result with one side test which is $t_{hitung} = 2.59$ score is higher than $t_{tabel} = 1.721$. It means the KBKM test score average of experimental student class reaches KKM. Meanwhile, the classical completeness using one side test is obtained $z_{hitung} = 1.13$ score which is higher than $z_{tabel} = 0.226$ score. As the result, H_0 has been refused and it has a meaning that student proportions who have got score >65 more than 75%. The result score of student creativity thinking test is served in table 2.



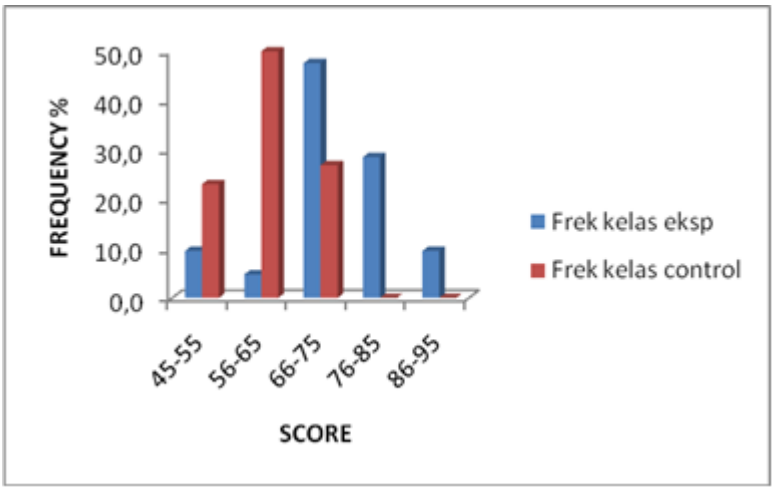
Picture 1. Mathematic Creative Thinking Ability Test Score

The test of students' activeness influence toward mathematic creative thinking ability is used simple regression test. The result obtained from linear regression test $Y = -17.112 + 1.145X$, has meaning that is every activeness variable addition (x) as big as one, so it will add KBKM test score (y) around 1.145. This calculation with distribution is obtained sig = 0.000= 0% score which is lesser than 5%. It means the student activeness influencing toward score test of student KBKM. The big of activeness influence toward KBKM is 78.4%. The students' activeness influence toward KBKM test is served in picture 3.



Picture 2. Student Effectiveness influence toward KBKM score.

The result of comparison test analysis is obtained sig score = 0.01 = 0.1% which is lesser than 5%, so H_0 is refused. It means both of the class have different KBKM test score average.



Picture 3. KBKM Score of Experimental and Control Class

The learning process effectiveness using TAI-typed cooperative model is applied by doing whether individual completeness test or classical completeness, influence test and comparison test. The learning result completeness test is measured by completeness test of student mathematic creative thinking ability. Individual completeness test is researched by using one side average test. Student mathematic creative thinking ability of experimental class reaches KKM and it means that experimental class reaches individual completeness. One side proportion test is done to find out classical completeness. The students' creative thinking ability is complete if the individuals' complete requirement is more than 75%. From 21 students, it results 18 (85.7%) who has passed the test with KKM 65, so the proportion of complete students is higher than 75%. The influence test shows that there is activeness influence toward mathematic creative thinking ability of the students. The comparison test result of the score of students' mathematic creative thinking with mathematic learning using constructivist-based TAI-typed cooperative model (average 70.7) is better than the class using conventional learning method (average 61.6).

CONCLUSION

In short, mathematic learning by using constructivist- based TAI-typed cooperative model is effective to be used to increase the creative thinking ability for trigonometry of the senior high school students of IPA XI. It can be seen from the completeness of KMBK classical test, which is 85.7%, and it shows that the students' activeness influence toward mathematic creative thinking ability is around 78.4%. The result of KBKM test shows that experimental class is better than control class.

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