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EFFECTIVENESS OF COOPERATIVE LEARNING MODEL FOR ENHANCING CAPABILITY OF INVESTIGATION TIPEGROUP RESOLUTION ON STUDENT MATHEMATICAL HIGHT SCHOOL

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Abstract

The purpose of this study are: (1) To determine the ability of mathematical problem solving class X SMA Negeri 1 Wundulako taught using cooperative learning model Group Investigation. (2)To determine the ability of mathematical problem solving class X SMA Negeri 1 Wundulakoyang taught using conventional learning model in teaching trigonometry. (3) To determine whether the mathematical problem solving ability of students taught bycooperative learning model of Group Investigationbetter than mathematics problem solving ability of students taught by conventional learning models in Class 1 Wundulako State XSMA in teaching trigonometry. This type of research used experimental method. The population in this study were all students of class X are scattered in seven classes in parallel with the number of 155 people. Sampling was conducted using random cluster sampling technique. In this study as a sample taken two classes of the population that there is a class X2 as an experimental class and class X4 as the control class. From the results of data analysis showed that: (1) average math problem solving ability X2 grade students taught using cooperative learning model type investigative groups (Group Investigation), which consists of 19 students showed minimum value maximum value 96.00 72.00 , the average (mean)87.0526, median88.00 and mode86.00, With a variance40.608And standard deviation 6.37246, (2 average math problem solving ability X4 grade students taught using conventional learning model which consists of 22 students showed 68.00 minimum value, maximum value 96, 00 average (mean)82.3636, median82,00, and mode82.00, With a variance58.147And standard deviation7.62543, (3) the results of t-test analysis using independent samples t-test obtained t =2.116 on the significant 0,005 <α = 0.05then H0 is rejected and H1 accepted. With the rejection of H0, it can be concluded that the increase in mathematical problem solving ability of students taught using cooperative learning model type investigative groups (Group Investigation) is better than math problem solving ability of students taught using conventional learning models.

Keywords: Model Cooperative learning, group investigation, mathematical problem solving ability, Trigonometry.

A. Introduction

Mathematics as one of the subjects are given in good schools at primary and secondary levels of education should be able to answer the challenge. This is because the subjects of mathematics are closely related to other subjects, so that if a student has an understanding of the mathematical concepts are good, then he will easily be able to learn other subjects, according to the National Council of Teachers of Mathematics or abbreviated NCTM (2000: 32) stated that learning and using mathematics is an important aspect in the overall school subjects. This is in line with the objective
general mathematics formulated in NCTM (2000: 29), namely: (1) the communication of mathematics (mathematical communication); (2) mathematical reasoning (mathematical reasoning); (3) The mathematical problem solving (mathematical problem solving); (4) the connection of mathematics (mathematical connections); and (5) the mathematical representation (mathematics representation).
To achieve these objectives will not be easy. various constraints and issues can be found in the field during the educational process takes place. It can be seen directly from the conditions in the schools in Kolaka that learning mathematics in general less optimal activity involves students in the learning process in the classroom, so that students are less active in the learning process. The use of conventional learning model is also dominated by the teacher with a teaching style that tends to be theoretical and one-way communication. The teacher was not giving freedom to the students to express their ideas, apply their knowledge and skills,
In addition, one student avoided the material is trigonometry. This is because the material trigonometry is one material that presents a lot of problems. Based on the percentage of data mastery of math hight school national examinations in the academic year 2014/2015, published by Balitbang, jakarta Ministry of National Education showed that the indicator resolve issues related to the law of sines and cosines rules southeast Sulawesi level reached 55.23% (Research and Development, 2011: 22). These results indicate that students are still difficulties in solving trigonometry.
For that, there needs to be efforts of teachers to create a conducive learning atmosphere that can lead students to be active and creative. Learning atmosphere like this, it will give hope to achieve maximum learning results. That is, the achievement of a number of abilities and skills of the process so that students are able to solve problems that exist in the environment. The attitude of the students in general tend to take knowledge from the teacher without trying to recall or re-associate with the knowledge previously accepted, students are also not trying to construct back existing knowledge into new knowledge or associate prior knowledge with the environment around it that can bring students easier to understand.
TIMSS and PISA study results show that, in general, students' mathematics achievement Indonesia is still relatively weak. Basic mathematics in TIMSS assessment are categorized into two domains, namely content and cognitive. Domain contents are numbers, algebra, geometry data, and opportunities. While the cognitive domain is the knowledge, application and reasoning (Pratikno, 2013: 3). The average Indonesian student mastering only the first cognitive domains such as knowledge and not to the extent of the application and reasoning.
Lack of mathematical problem solving ability of students is also caused by the process of mathematical learning in the classroom less increase hight-level thinking skills (hight order thinking skills). In this case, the teacher just gives assignments in class exercises and at home to students who lack the aspect of problem solving. Teachers are still focusing on routine matters in textbooks, questions like these are less give opportunities for students to practice developing the ability to solve mathematical problems (Fitriany, 2010: 14). Exercises are also less directly related to the everyday real life. Learning like this is not in line with the aim of giving mathematics at hight school students, namely that students have problem-solving ability, and not in line with the principles of curriculum development, that is centered on the needs, the needs and interests of learners and the environment as well as relevant to the needs of future life now. Condition as described above push the need for an innovative learning mathematics requires more innovative learning approaches. Cooperative learning model Investigation something form cooperative learning groups that have a pressure point on the participation and activities of the students to find their own material or anything about the subject matter to be studied. (Kurniasih, 2015: 72) Conditions such as has been described above push the need for an innovative learning mathematics requires more innovative learning approaches. Cooperative learning model Investigation something form cooperative learning groups that have a pressure point on the participation and activities of the students to find their own material or anything

about the subject matter to be studied. (Kurniasih, 2015: 72) Conditions such as has been described above push the need for an innovative learning mathematics requires more innovative learning approaches. Cooperative learning model Investigation something form cooperative learning groups that have a pressure point on the participation and activities of the students to find their own material or anything about the subject matter to be studied. (Kurniasih, 2015: 72)

Embodies the hope that in the learning activities of teachers began to make adjustments to changes in the curriculum, as well as an active student learning orientation, generate multidirectional interaction and social skills, as well as load constructivism, the cooperative learning model Investigation Group is one option. The success of the implementation of cooperative learning model Investigation Group is dependent on the role and preparedness of teachers in it. So that the model is expected to overcome the lack of mathematical problem solving ability of students of Class X SMAN 1 Wundulako especially on the material Trig.

Based on the description has been put forward, it is generally a problem in this research are:Based on the description of the background above, the problem in this research is Does increased mathematical problem solving ability of students taught by cooperative learning model Investigation Group more effective than the increase in mathematical problem solving ability of students taught by conventional learning models in class X SMA Negeri 1 Wundulako?

As for the objectives in this study are To determine whether the increase in mathematical problem solving ability of students taught by cooperative learning model of Group Investigation better than mathematics problem solving ability of students taught by conventional learning models in class X SMA Negeri 1 Wundulako in teaching trigonometry.

B. Literature Review

Mathematical Problem Solving Ability

Problem-solving ability is the ability to create an internal representation of the problem, which is to pay attention to relevant information, ignore things that are not relevant, and decide how to represent a problem. To make it easier to understand the problem and makes it easy to get a general overview of completion, preferably important things that should be recorded, and if need be created for the table or even made a sketch or graph (Kadir, 2009: 10).

In solving a problem, there are four steps to be taken, namely: understanding the problem (understandingthe problem); planning solution (devising aplan); calculating (carryingout the plan); and check back (looking back). According to (Foshay & Kirkley, 2003: 4, in Kadir 2008), the process of solving the problem is a cognitive process which involves highter-level thinking and utilizing whole mental activity of students ranging from representing a problem, to plan the search for solutions, implement the plan solutions while recalling all the knowledge that has been gained (recall). In the process sometimes fails so students need to see the representation of the problem or solution formulation of the plan,

Learning Effectiveness

Effectiveness comes from the word "effective in large dictionary Indonesian effective" means: (1) no effect (consequently, influence, impression), (2) can bring results, effective. As for effectiveness means: (1) the circumstances influential: memorable thing, (2) the success of the business or action (KBBI, 2009: 127). Said (Fitriani, 2012: 5) points out that the effectiveness of the means trying to achieve goals that have been set in accordance with the necessary means, in accordance also with the plan, both in the use of the data, the means, nor the time or work through specific activities both physical and non- physical to obtain maximum results both quantitatively and qualitatively.

Model Cooperative learning model Investigation Group

Cooperative learning model Investigation something form cooperative learning groups that have a pressure point on the participation and activities of the students to find their own material or anything about the subject matter to be studied. Cooperative learning model Groups Investigation also involve students start planning well in determining the topic as well as a way to learn through investigation by demanding the students to have a good ability to communicate and in skill group process so that it can train students to cultivate the ability to think itself. (Kurniasih , 2015: 72).

According Kurniasih (2015: 74), Steps Cooperative Learning Model Investigation Group include:

a. selecting Topics

The first stage students choose various subtopics material to be studied or from the description given by the teacher, and then organize students into groups of task-oriented comprising 2 to 6 people.

b. Planning for Cooperation
Together with students, teachers plan learning procedures, tasks and general objectives that are consistent with a variety of topics and subtopics have been from step 1 above.

c. Implementation
The students carry out the plans that have been formulated in step (planned cooperation) above. The implementation process involves a variety of activities and skills with a wide variance and encourage students to use a variety of sources, both contained within or outside of school, and the teachers should make sure each group is not experiencing difficulties.

d. Analysis and synthesis
Students analyze and synthesize information obtained in step (implementation) and planned to be summarized in something interesting presentation to the class.

e. Presentation of final results
With the supervision of teachers, each group presented a variety of topics that have been studied so that all students in each class involved and reach a broad perspective on the topic.

f. Doing Evaluation
Together students, teachers evaluate the contribution of each group to the class as a whole work. The evaluation may include each student individually or in groups, or both.

Conventional Learning Model

Conventional learning model can be called with traditional learning. Traditional teaching is the teaching which is generally done by the teachers in the school. (Suherman, 2001: 255). Setyowati (2014: 157), Steps Learning Model Convensional include:

a. Delivering destination
Teacher convey all the learning objectives to be achieved in these subjects

b. Presenting information
Teachers present information to students step by step with the lecture method

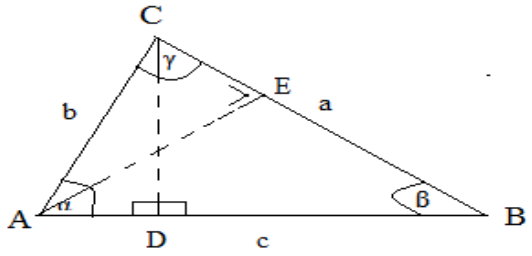
c. Checking comprehension by using feedback
At this stage, the teacher checks students' success and provide feedback.

d. Providing the opportunity for further training
At this stage, the teacher gives additional tasks to be done at home

Trigonometry

pratiwi (2013: 677) states the term trigonometry is composed of two Greek words, namely "trigonos" means triangle and "metron" meaning measure, so in accordance with the trigonometric origin word mean size of the triangle. In today's development as trigonometry is not just a study of triangles and angles, but also is a branch of modern mathematics which deals with the circulation and function.

a. Sinus rules



1) | CD | = B sin α (in terms of angle α)
2) | CD | = A sin β (viewed from the angle β)
3) | AE | = C sin β (viewed from the angle β)
4) | AE | = B sin γ (viewed from the angle γ)

From 1) and 2) obtained by the relationship:

| CD | = | CD | = B sin a sin α = β. Then $\boxed{\frac{a}{\sin\alpha} = \frac{b}{\sin\beta}}$ ..... (1)

3) and 4) were obtained ties:

| AE | = | AE | = C sin β = b sin γ. Then $\boxed{\frac{b}{\sin\beta} = \frac{c}{\sin\gamma}}$ ... (2)

So from (1) and (2) it can be concluded:

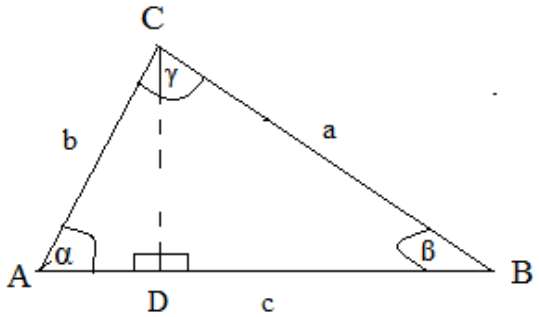
$$\frac{a}{\sin \alpha} = = \frac{b}{\sin \beta} \frac{c}{\sin \gamma}$$

The rules of what is called the law of sines can be used to locate elements of a triangle (side length and a large angle). If it comes to other elements. Possible elements are known as follows:

1) side - side - corner
2) angle - side - corner
3) side - corner - corner

b. The cosine rule

If a triangle of known elements is the length of two sides and an angle which is flanked by side, is also a triangle whose three sides are known, then we can not specify other elements using sine rule. Therefore, to resolve the issue used cosine rule.



This image shows a triangle ABC, with sides length a, b and c, as well as the CD is the hight line of the triangle ABC.

note the right-angled triangle ACD in D!

CD = b sin α ..... (1)

AD = b cos α

Long DB = AB - AD = c - b cos α .... (2)

Note the BDC right-angled triangle in D, using the Pythagorean theorem, obtained:

(CB) 2 = (DB) 2 + (CD) 2 .... (3)

Substituting (1) and (2) to the equation (3) is obtained:

a2 = (c - b cos α) 2 + (b sin α) 2

⇨ a2 = c2 - 2 bc cos α + b2 + b2 sin2 cos2 α α

⇨ a2 + b2 = c2 (α + b2 sin2 cos2 α) - 2 bc cos α

⇨ a2 + b2 = c2 (1) - 2 bc cos α

⇨ a2 + b2 = c2 - 2 bc cos α.

In the same way can also be shown that:

a2 + b2 = c2 - 2 ac cos β and c2 = a2 + b2 - 2 ab cos γ

C. Methodology

This type of research is a kind of True experimental research design that involves two classes, namely the experimental class and control class. Where the experimental class is treated with the implementation of cooperative learning model type Investigation Group, while the untreated control group.In this research there are two variables, as follows: mathematics problem solving ability of students taught by models Investigation Group cooperative learning mode While and mathematical problem solving ability of students taught by conventional learning models. This study aimed to investigate the effectiveness of the cooperative learning model type Investigation Group on Class X student of SMAN 1 Wundulako. As for the design of experiments conducted in this study is the posttest-only Control Design

This study will be conducted over 10 months starting from January 2018, until the month of October 2018 took place in the city of southeast Sulawesi Kolaka precisely in SMA Negeri 1 Wundulako district. Wundulako Kab. Kolaka, South East Sulawesi 2017/2018 school year in class X which comprises seven parallel classes.The population in this study were all students of class X SMA Negeri 1 Wundulako in academic year 2017/2018 which consists of 7 classes of students sebnyaok parallel with the number of 155 people. In this study as a sample taken two (2) classes of the population who ada.Dari 2 (two) kelastersebut, will be treated learning with

learning model Group Investigation and conventional learning models. Based on how to determine the sample size, the sampling technique of population in this study using cluster random sampling. The data collection technique is an activity to obtain the required data to be processed and presented in accordance with the problems encountered. The data used in penelitianini are: (1) The quantitative data,

Data Technique collection is done using the test, is used to collect data mathematical problem solving ability of students after being given the subject matter of mathematics, as well as data regarding the enforceability of learning and student activity sheets in the form of observation. Instrumenyang used in this study adalahtes ability to solve mathematical problems, which is where there are two classes were given a different treatment and a form of mathematical problem solving abilities instrument in the form of an essay test, while the non-test instruments in the form of sheets of observation of teachers and students.

Validity test The validity of the items used to determine the score of each item on the support to the total score. Greater support of score items to the total score, the highter the validity of the question. Thus, to test the validity of each item, the score of each item correlated with the total score using the formula Product Moment Correlation.While reliability mengacup no precision results obtained from the measurement. Nasution and Suryanto (2007: 5.5). Having tested the validity level, then each instrument was tested levels of reliability by using Cronbach alpha formula. While the data analysis technique in this study consisted of data analysis descriptive and inferential data analysis. By using independent sample t-test.

As for the statistical hypothesis in this study are as follows:

Ho: $\mu_1 \leq \mu_2$

Ha: $\mu_1 > \mu_2$

Information:

μ_1 = Average CAR increase students taught by modelgrup investigation

μ_2 = Average CAR students taught by conventional models

$\mu_1 \leq \mu_2$ = KPMM students taught by modelgrup investigas itidak highter than students taught by conventional models.

$\mu_1 > \mu_2$ = KPMM students taught by modelgrup investigation was highter than students taught by conventional models

D. Findings and Discussion

1. Findings

Table 4.1 1Hasil Descriptive Analysis Capabilities Against Grade Math problem solving Class Experiment and Control

Descriptive analysis	Experiment	Control
Mean	87.0526	82.3636
Median	88,0000	82,0000
Mode	86,00	82,00
Standard Deviation	6,37246	7,62543
Variance	40,608	58,147
Minimum	72,00	68,00
Maximum	96,00	96,00

Based on descriptive analysis results in Table 4.1, the average values obtained mathematical problem solving ability of students taught using cooperative learning model type Investigation Group (Group Investigation) (experimental class) of75.95 and the average value of mathematical problem solving ability of students taught using conventional learning models (control group) of70.65. It shows that the average math problem-solving abilities in teaching Trigonometry to experimental class is highter than the average math problem-solving abilities in teaching Trigonometry to control class.

Table 4.2. Hypothesis testing

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)

Posttest	Equal variances assumed	,863	,359	2,116	39	,041
	Equal variances not assumed			2,145	38,967	,038

From Table 4.6 is obtained Hasiluji hypothesis on line Equal variances assumed with t =2.116 on the significant 0,005 <α = 0.05 then H0 rejected and H1 be accepted. With the rejection of H0, it can be concluded that the mathematical problem solving ability of students taught using cooperative learning model Type Investigative group (Group Investigation) better than mathematics problem solving ability of students taught using conventional learning models.

2. Discussion

Based on research, found that descriptive problem solving ability of students taught using cooperative learning model type Investigative group (Group Investigation) that consists of 19 students showed minimum72,00 value maximum value of 96.00, the average (mean)87.0526, median 88.00and mode 86.00, With a variance 40.608 and standard deviation 6.37246, While the students are taught using conventional learning model which consists of 22 students showed 68.00 minimum value, maximum value 96, 00 average (mean)82.3636,median82.00, and mode 82.00, With a variance 58.147 and standard deviation 7.62543, This shows that the mathematical problem solving ability of students taught cooperative learning model type Investigative group (Group Investigation) highter than the mathematical problem solving ability of students taught using conventional learning model in teaching trigonometry.

The results of hypothesis testing using Sample t Independent-test with dk = 39 at significance level α = 0.05 was obtained t-count =2,116 and t-tabel= 2.022. because t-count > t-table, Then the hypothesis testing with test Independent Sample t-test show that Ho declined, inferential this means that there are significant differences between the cooperative learning model type Investigative group (Group Investigation) with conventional learning models, where the average value of mathematical problem solving ability of students taught using Model Cooperative learning Type Investigative group (Group Investigation) is better than the average value of mathematical problem solving ability of students taught using conventional learning models. This difference is due to the experimental class students have been trained and used to perform a variety of exercises that have a hight difficulty level. So that when students work on the problems of post-test, they are not too difficult to resolve. This is in line with research conducted by Fitriani (2010: 27) states that an increase in mathematical communication skills and students' mathematical problem solving Through Learning Model Means-Ends Analysis.

E. Conclusion

1. The average math problem solving ability X2 grade students taught using cooperative learning model type investigative groups (Group Investigation), which consists of 19 students showed minimum value 96.00, 72.00 maximum value, the average (mean) 87.0526, median 88.00 and mode 86.00, With a variance 40.608And standard deviation 6.37246
2. The average math problem solving ability X4 grade students taught using conventional learning model which consists of 22 students showed 68.00 minimum value, maximum value 96, 00 average (mean)82.3636,median82.00, and mode82.00, With a variance 58.147and standard deviation7.62543.
3. The results of hypothesis testing using sample t Independent-test with significance level df = 39 pada obtained value α = 0.05 t =2,116 and t-tabel= 2.022. because t-count > t-table, Then the hypothesis testing with test Independent Sample t-test show that H0declined, inferential this means that there are significant differences between the cooperative learning model type Group investigative (Group Investigation) with Conventional Learning Model, where the average value of solving abilities mathematics problem students taught by using cooperative learning model type Group investigative (Group Investigation) is better than the value the average math problem solving ability of students taught using conventional learning model in teaching trigonometry.

F. References

Arikunto. (2015). *Dasar-Dasar Evaluasi Pendidikan (Edisi Revisi)*. Jakarta: Bumi Aksara

Beell, F. H. (1978). *Teaching and Learning Mathematics (In Secondary Schools)*. United States of America. Wm. C. Brown Company Publisher

Fitriani. (2012). Efektivitas Pendekatan Quantum Learning dalam Pembelajaran Aritmetika Sosial pada Kelas VII SMP Negeri 3 Sinjai Utara. *Skripsi. Tidak diterbitkan.* Makassar: FKIP UNISMU

Foshay, R. & Kirkley, J. (2003). *Principles for Teaching Problem Solving.* Retrieved from. www.plato.com/downloads/papers/paper_04.pdf.

Harefa, A. (2000). *Menjadi Manusia Pembelajar*. Jakarta: Kompas

Ibrahim. (2000). *Pembelajaran Kooperatif.* Surabaya: Unesa.

IEA. 2012. TIMSS 2011 International result in mathematics. Retrieved from. http://timss.bc.edu/timss2011/downloads/T11 IR M Chapter1.pdfT28.

Kurniasih, D. (2015). Upaya Mengaktifkan Siswa Dalam Pembelajaran Getaran Dan Gelombang Melalui Pendekatan Konstruktivis Realistik Pada Siswa Smu Swadhipa Natar. *Makalah Bandar Lampung*: FKIP UNILA

Prosperous. (2011). Effectiveness of Application of Cooperative Learning Model Type Make a Match in Improving Learning Outcomes in Mathematics in Basic Competence Square and Rectangle Seventh Grade Students of SMP Negeri 2 Pomalaa. Essay. *Unpublished. Kolaka: FKIP USN*

Natalie, M. D. (2013). *"Dituntut Menghafal, Materi Mudah Terlupakan".* Harian Jogja

Nasution. (1999). *Tekhnologi Pendidikan.* Jakarta: Bumi Aksara

OECD. (2013). PISA 2012 result: what students know and can do. *student performance in mathematics, reading and science (volume, I)*. Retrieved from. http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-I.pdf.

Polya, G. (1985). *How to Solve It. A New Aspect of Mathematical Method. Second Edition.* New Jersey: Princeton University Press.

Ruseffendi, E. T. (2006). *Pengantar Kepada Membantu Guru Mengembangkan Kompetensinya dalam Pengajaran Matematika untuk Meningkatkan CBSA.* Bandung: Tarsito.

Sagala, S. (2011). *Konsep dan Makna Belajar dan Pembelajaran*. Jakarta:Alfebeta.

Syarifuddin. (2009). *Pembelajaran Matematika Sekolah.* Retrieved from. http://syarifartikel.blogspot.com/.

Sugiyono. (2013). *Metode Penelitian Pendidikan* (Edisi Revisi). Bandung: Alfabeta

Suherman. (2001). *Strategi Pembelajaran Matematika Kontemporer.* JICA, UPI Bandung.

Sumarmo. (1994). Suatu Alternatif Pengajaran untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika pada Guru dan Siswa SMP*. Laporan Penelitian FP MIPA IKIP* Bandung.

Suherman, E. (2003). *Evaluasi Pengajaran Matematika.* Bandung: UPI.