

The Effect of Student Team Achievement Division Cooperative Learning on The Concept Understanding Ability of Mathematic

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Abstract— The learning model of cooperative learning type Student Team Achievement Division (STAD) is one of the most simple cooperative learning models. The main advantages of this model lies in activity and interaction among students to motivate and help each other in mastering the subject matter, understanding the concepts, discussing in solving problems and tasks given by teacher. The purpose of this study is to test the effect of the STAD learning model on the student's concept understanding ability. This study is a quasi-experimental research using posttest only control design. The research population is all student of fifth grade and measurement instruments using essay test. The result of measurements of the concept understanding ability of mathematic in the form of data and analyzed using t-test. Based on the data analysis, average the concept understanding ability of mathematic in the classroom experiment that is equal to 91.25, while the control class at 64.55. The results of the t-test analysis shows that $t_{count} > t_{table}$ or 2,65 greater than 2,02. This mean that H_0 refused and H_1 accepted So there is the effect of STAD learning model on the concept understanding ability of mathematic.

Keywords—concept understanding ability of mathematic; quasi-experimental research; student team achievement division

I. Introduction

This Education in the country of Indonesia is done in an effort to improve the quality of society. The success of an education can be seen from the success of the learning process. The higher the success rate of the learning process then the quality of society in the country the better. This is in accordance with Regulation of National Education Minister (Permendiknas) No. 20 of 2003 which states that education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, as well as the skills needed by him/ herself, nation and state.

Mathematics is a pure science that is very useful, especially in everyday life. The purpose of learning mathematics in school, quoted from Regulation of National Education Minister (Permendiknas) No. 22 in 2006 is that students have the ability to understand mathematical concepts, using reasoning in patterns and traits, solving problems, and communicating ideas

with symbols, tables, diagrams or other media to clarify circumstances or problems. In the purpose of learning mathematics mentioned above can be done well if students have a good concept of understanding. So it can be concluded we can achieve the objectives of other mathematics learning if the understanding of mathematical concepts has been achieved well. This is in line with the opinion of Ruseffendi, that there are many learners who, after learning mathematics, are unable to understand even in the simplest parts, many concepts are misunderstood so that mathematics is regarded as difficult and difficult [8].

Achievement of learning objectives of mathematics in schools certainly cannot be separated from the role of teachers. In this case, the teacher as a learning facilitator is demanded creatively. Based on the results of interviews of mathematics teacher grade V in elementary school state 060819 Medan, students of grade V elementary school has a low ability in learning mathematics, thus impacting on the low understanding of mathematical concepts in mathematic lessons. This can be seen from the average value of the odd semester class of the academic year 2016/2017 is 46.48 which is still below the criteria of minimal mastery.

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Piaget in the view of constructivism views cognitive development as a process whereby children actively build systems of meaning and understanding of reality through their experiences and interactions [11]. John Dewey, defines learning as a process through integration, experience, knowledge, observation and action [2].

Ratumanan (2004: 45) suggests that Vygotsky's work is based on two main ideas. First, intellectual development can be understood only when viewed from the historical and cultural context of the child's experience. Second, development depends on signaling systems referring to symbols created by culture to help people think, communicate and solve problems, thus the cognitive development of children requires a system of cultural communication and learning to use these systems to adapt thinking processes self.

According to Slavin, there are two major implications of Vygotsky's theory in education [7]. Firstly, it is desirable that classroom settings take the form of cooperative learning between different groups of students with different abilities so that students can interact in difficult tasks and generate effective problem-solving strategies within their respective proximal development areas. Second, Vygotsky's approach to learning emphasizes scaffolding. With scaffolding, the longer the students are able to take responsibility for their own learning.

The learning model of cooperative learning type Student Team Achievement Division is a learning model that forms a learning group consisting of 4-5 people, in which members of the group are heterogeneous, which means having differences in academic ability, gender, ethnicity, and race. Eventually the students will help each other in understanding the concepts, discussing in solving problems and tasks given by teacher. Where the Student Team Achievement Division's learning model also has a goal, so that students' academic learning outcomes are improved and students can receive a variety of diversity from their peers, as well as develop social skills. Student oriented learning process is strongly recommended to be applied in variety of cooperative learning models for all subjects in education unit done by professional teachers to avoid any discrepancy of students' achievement [3].

The steps are as follows: 1) Teachers form groups of 4 people heterogeneously (mix by achievement, gender, ethnicity, etc); 2) The teacher presents lessons; 3) The teacher assigns a task to the group to be done by the group members. Its knowing members explain to the other members until all the members in the group understand; 4) Teacher gives quiz / question to all students. When answering a quiz cannot help each other; 5) Evaluate; 6) Conclusion.

According to Davidson, the advantages of Student Team Achievement Division learning model include: improving individual skills, increasing group skills, increasing commitment, eliminating prejudice against peers, not competitive [5]. According to Slavin, the lack of learning models of Student Team Achievement Division types are: the contribution of low achieving students to less, high achievers will lead to disappointment because the role of clever members is more dominant [5].

II. METHOD

This research was conducted in class V semester I of academic year 2016/2017 state of elementary school 060819 Medan which is located at Saudara street No. 66A District

Sudirejo II Medan City. The population of this research is the students of class V consisting of two classes namely VA class amounted to 20 and VB which amounted to 22 students. The class VA becomes the experimental class and the class VB becomes the control class. This study is a quasi-experimental research that aims to determine the effect of cooperative learning model of Student Team Achievement Division type to the students' mathematical concept. The design of this research is posttest only control design.

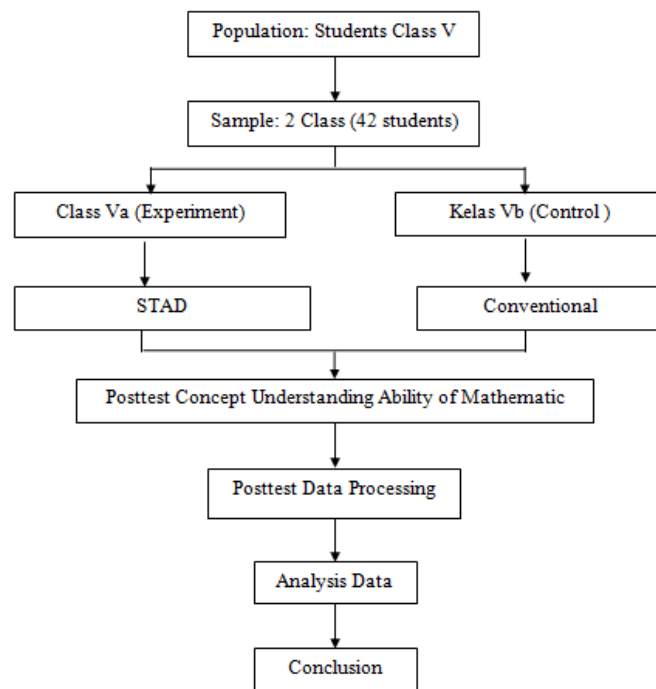


Fig. 1. Research Design Scheme

Based on figure 1, shown the research design scheme. Next through planning steps, preparation phase and stage implementation. The look of the research design can be seen in the following table:

TABLE I. RESEARCH DESIGN

Group	Treatment	Posttest
E	X	O ₁
P	C	O ₂

The Information:

E : Experiment class

P : Control class

X : STAD type learning

C : Conventional learning

O₁ : Post-test scores on the class
Experiment

O₂ : Post-test scores on the class
Control

The steps in this research are:

1. School orientation, to know the number of classes, number of students, how teachers teach and characteristics of students;
2. Develop a lesson plan (RPP) for the experimental class and control class;
3. Preparing the test instrument and its scoring rules;
4. Validate the instrument;
5. Conducting an instrument test;
6. Repair the instrument;
7. Conducting treatment in the experimental and control class;
8. Conducting test on expression-class and control class;
9. Analyzing data;
10. Make a conclusion.

The data in this research is the value data understanding of mathematical concepts obtained by the method of ability to comprehend the concepts of mathematical students at the end of learning (posttest). Instruments in this study is a tool of understanding the concept of students in the form of questions in the form of description. Preparation of research instruments is done by making lattice problem, item about essay, and rubric of assessment. The item must meet the qualification of the question that is suitable for data retrieval, which must be valid and reliable.

After the test question is valid, test is done about the test in class V elementary school state 060819. After testing the reliability test, then analyze the test results to determine the reliability. According to Arikunto a test is said to be reliable if the reliability coefficient is > 0.70 [1]. Based on test analysis, test instrument coefficient obtained $r_{11} = 0,73$. Then the test instrument is considered reliable and can be used in research to measure students' mathematical understanding.

After the calculation of the test results data understanding of mathematical concepts to the class that uses cooperative learning model of Student Team Achievement Division type and class using conventional learning, obtained data summarized in the following table:

TABLE II. SUMMARY OF TEST RESULT DATA CONCEPT UNDERSTANDING ABILITY OF MATHEMATIC

Class	Average
STAD	91,25
Conventional	64,55

Based on the data in Table 2, the average grade of the Student Team Achievement Division is more than the average grade in the conventional class. Furthermore, the prerequisite test is tested normality and homogeneity test.

For normality data by looking at Kolmogorov-Smirnov will be done with the help of program SPSS 22 for windows. The result of Normality Test calculation can be seen in the following table:

TABLE III. SUMMARY OF TEST RESULTS DATA NORMALITY CONCEPT UNDERSTANDING ABILITY OF MATHEMATIC

No.	Class	Significance value (Asymp. Sig)	Decision	Description
1	Experiments	0,326	0,326	Normal
2	Controls	0,547	0,547	Normal

Based on the normality test results in the table, it can be seen that the data is normally distributed. This can be seen from the significance value (Asymp.sig) of each class, the significance value of the experimental class of 0.326, the significance value of the control class of 0.547. Because the significance value of these two classes is more than 0.05 then the two data are declared to be normally distributed.

Testing homogeneity done after tested the normality is with using a univariate analysis test with levene's test with the help of the program SPSS 22 for windows. The calculation of statistic test is obtained by the test result homogeneity of experiment class data and control class data as follows:

TABLE IV. SUMMARY OF TEST RESULTS DATA NORMALITY CONCEPT UNDERSTANDING ABILITY OF MATHEMATIC

No.	Class	Significance value (Asymp. Sig)	Decision	Description
1	Experiments	0,102	0,102	homogeneity
2	Controls		0,05	

Based on Table 4 summarizes the results of homogeneity test of the ability of the mathematical concepts above, it can be seen that significant value 0,102 and significant level 0,05, because significant value $>$ from significant level, it can be concluded that variant of both classes have the same or homogeneous variant. Based on prerequisite test result, it can be concluded that both data are normal and homogeneous distributed, hence hypothesis test using t-test.

III. RESULT AND DISCUSSION

After the prerequisite test and the result of the two data are normal and homogeneous distribution, then do hypothesis test using t-test.

TABLE V. SUMMARY OF HYPOTHESIS THE RESULT DATA CONCEPT UNDERSTANDING ABILITY OF MATHEMATIC

No.	Class	t count	t table	Test Decision
1	Experiments	2,65	2,02	Accept H_0
2	Controls			

Based on the results of the calculation of conceptual ability data, obtained t count $>$ t table with $df = 40$ [9], then the decision test reject H_0 and accept H_1 which means that the

average value of the ability of understanding the concept of a class that uses cooperative learning model type Student Team Achievement Division is more than the average value of conceptual understanding in a class that uses conventional learning.

The above test results are in accordance with the research of Trat (2014) quoted from International Journal Sciences under the title Effects of Student Teams Achievement Division (STAD) on Academic Achievement, and Attitudes of Grade 9th Secondary School Students toward Mathematics. This study examines the effects of cooperative learning on academic achievement in mathematics and attitudes of 74 9th grade mathematics students on mathematics at a Vietnamese high school. Using a group-independent none-comparison-pre-test-post-test nonequivalent and t-test for independent samples, it was found that after about 5 weeks the students ($n = 36$) who were instructed to use cooperative learning achieved significantly higher scores in post-test math than students $N = 38$ were instructed to use lecture-based teaching, $t(72) = 2.68$, $dk = 58.49$, $p < 0.05$. The results of this study also reported that the experimental group had significantly higher scores than the control group on both the Pleasure and Values of attitude scales on mathematics ($t(72) = 2.81$, $dk = 53.68$, $p < 0.05$; $t(72) = 2.86$, $dk = 55.58$, $p < 0.05$, respectively). The study concludes that cooperative learning is effective in improving the level of academic achievement of participating students, and in promoting students' positive attitudes toward math at Vietnamese high school level [10].

According to Genkosman's research (2012) quoted from the Journal of Baltic Science Education with the title Effect of Student Teams Achievement Divisions Technique Used In Science And Technology Education On Self-Efficacy, Test Anxiety And Academic Achievement. The study aims to determine the effect of teaching "Generation and Motion" units of Science and Technology classes using Student Teams Achievement Divisions (STAD) techniques on self-efficacy, anxiety tests and academic achievement of seventh grade students. STAD technique was applied to the experimental group; Existing programs based on constructivism to control-1 groups, and traditional teaching methods for control-2 groups. The analysis of the obtained data is achieved by using one way variance analysis (ANOVA). In conclusion, it was determined that the experimental group was more effective than the control group in terms of self-efficacy and academic achievement. In addition, significant improvements were gained in student exam anxiety in experiments and control-1 groups compared to those in which traditional teaching methods were used [4].

In addition, according to Pandey Research (2003) quoted from the Journal of Science and Mathematics Education in s.e. Asia with the title Effect of Cooperative Learning on Cognitive Achievement in Science. This study examines the influence of one method of cooperative STAD learning on achievement in science in the Indian context. This study uses two intact classes of class 9 students with 36 students. Both classes are taught the same context for a duration of twenty five instruction days. Students in the experimental class work in small heterogeneous groups studying the content while the other classes are taught

by traditional lecture-discussion methods. Student outcomes are measured by the development of achievement tests for this purpose. Data were analyzed through covariance analysis [6].

Reveals that STAD is more effective than traditional methods for knowledge levels as defined by Bloom's taxonomy. However, both methods are found equally effective for the level of understanding. Theoretically, learning with STAD type cooperative learning model is better than conventional learning model. In STAD type cooperative learning students are required to think and cooperate with their group in doing the LAS, helping each other and ensuring that each student must understand the material because at the end of the learning the students are given the test individually without helping each other. Students look enthusiastic in paying attention to teacher explanations because students want to be best for personal or group interests to increase individual or group points in order to gain an award. To gain group awards, each group member has the same responsibility.

Therefore, students are more eager to learn so that students are motivated to improve material understanding that can automatically optimize their learning outcomes. If difficulties occur in the discussion, students do not hesitate to ask the teacher. This shows that the ability of teachers as facilitators in managing learning is necessary for the learning process to run effectively.

In conventional learning students are required to work individually to solve existing problems so that students are embarrassed and afraid to ask friends or teachers about problems that have not been understood. This can be seen from the average of achievement of student indicator that use STAD type cooperative learning is higher than students using conventional learning.

This research is said to be successful or have an effect on the understanding of mathematical concepts of students when the understanding of mathematical concepts of students who are taught by using STAD type cooperative learning model is higher than the class taught by conventional learning model.

When viewed from the minimal criteria specified minimal, STAD learning gives effect because the average understanding of mathematical concepts of students is higher than the minimum mastery criteria. This is because students who score above the minimum criteria mastery.

IV. CONCLUSION

Based on the results obtained, it can be concluded that taught with cooperative learning model type Student Team Achievement Division gives influence to the ability of understanding mathematical concepts of students. Student Team Achievement Division cooperative learning can help students to be more enthusiastic and responsible in learning so as to help students to absorb the subject matter better. This can be seen in the results obtained, that the ability to understand the mathematical concepts of students using cooperative learning type Student Team Achievement Division better than the understanding of mathematical concepts of students who use conventional learning. This the application of cooperative learning model type Student Team Achievement Division have

a positive effect on the understanding of mathematical concepts of students of grade V elementary school state 060819 Medan academic year of 2016/2017.

The authors propose some suggestions to:

- a. Teachers who teach in elementary school to use innovative learning strategies or models in teaching one of them is a model of cooperative learning type Student Team Achievement Division as an alternative in learning mathematics.
- b. For advanced researchers to study more deeply about cooperative learning model of Student Team Achievement Division type on other subject and other variables.

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