International Journal of Trends in Mathematics Education Research
Vol. 2, No. 4, August 2019, pp. 168-172
Available online at http://ijtmer.com

E-ISSN : 2621-8488

RESEARCH ARTICLE

The Effect of Cooperative Learning Type Student Teams Achievement Division (STAD) on Understanding Mathematical Concepts in Class VIII Students of MTs N Pekanbaru

Putri Wahyuni*

Department of Mathematics Education, Riau Islamic University, Pekanbaru, Riau, Indonesia, 28284
**Corresponding Author: wahyuniputri@edu.uir.ac.id*

How to Cite: Wahyuni, P. (2019). The Effect of Cooperative Learning Type Student Teams Achievement Division (STAD) on Understanding Mathematical Concepts in Class VIII Students of MTs N Pekanbaru. *International Journal of Trends in Mathematics Education Research, 2* (4), 168-172.

ARTICLE HISTORY

Received: 8 April 2019
Revised: 16 May 2019
Accepted: 26 June2019

KEYWORDS

Cooperative type STAD
Understanding of mathematical concepts
Initial ability

ABSTRACT

This study starts from the problem of the low understanding of the mathematical concepts of MTs N Pekanbaru students. This can be seen in the results of tests of understanding mathematical concepts obtained by students. To overcome this problem, STAD type cooperative learning is used. The purpose of this study was to determine the effect of the STAD type cooperative learning model on understanding the mathematical concepts of class VIII MTs N Pekanbaru students. This type of research is Quasi Experiment. The population in this study were Pekanbaru MTs N students. The sample in this study was class VIII MTs Simpang Tiga Pekanbaru as an experimental class and class VIII MTs N Muara Fajar Pekanbaru as a control class randomly selected. The instrument used is a written test regarding understanding students' mathematical concepts. The data obtained were analyzed using the t test, Mann-Whitney U test. The results showed that (1) understanding of mathematical concepts students taught by STAD type cooperative learning was higher than students who were taught using conventional learning, (2) understanding students' mathematical concepts high initial ability taught by STAD type cooperative learning is higher than high initial capable students taught with conventional learning, and (3) understanding mathematical concepts of low initial ability students taught by STAD type cooperative learning is higher than low initial ability students taught with conventional learning.

1. INTRODUCTION.

Mathematics is part of the subjects in the school to develop the ability of students in science and technology that are in line to facilitate students in facing future life (Netti, 2019). Given the importance of teaching mathematics, the teacher must be able to educate and train students in learning so that the mathematics goals in the school can be achieved. In an effort to achieve the goals of mathematics learning, the teacher as one of the factors that adequately determines the success of students, always strives to improve quality in carrying out the mathematics learning process, so that it can improve students' mathematics learning outcomes. Related to this, Nasution (2008: 115; Fitriana, 2019; Misu, 2019) states that in order to obtain satisfying learning outcomes, a teacher should strive so that students can be active in the learning process. A teacher is expected to act as a facilitator and motivator for students who are able to choose learning strategies that can activate students.

According to Mulyono (2018) Understanding of concepts manifests or reflects (reflects) a student's ability to provide explanations as well as reasons (to reason) in in-settings that involve careful and measurable application of concept definitions, relations -relations, or representations. According to Karenia in Gilang (2018) Understanding of concepts is an ability that is concerned with understanding mathematical ideas that are comprehensive and functional. Understanding concepts is more important than just memorizing. Therefore, don't be wrong in giving direction or guidance to students. Because one gives a little direction to students, surely the concepts students will understand will not be understood by students.

Furthermore, according to Susanto in Mawaddah (2016) states that understanding is a process that consists of the ability to explain and interpret something, is able to provide a description and example and explanation that is wider and adequate and able to provide more creative descriptions and explanations, while the concept is something that is reflected in the mind, a thought, an idea, or an understanding. So that students are said to have the ability to understand mathematical concepts if he can formulate a settlement strategy, apply simple calculations, use symbols to express concepts, and change a form to other forms such as fractions in mathematics learning.

Based on the observation of the authors in several equivalent MTs N in Pekanbaru, information was obtained that student learning outcomes were still low. This is due to the fact that most students

find it difficult and do not like math, which causes students' low mathematics scores. Then based on the results of the interview, information was obtained that the teacher rarely provided exercises regarding mathematical abilities, especially understanding students' concepts. This is supported when given questions about understanding concepts to students only a few people are able to answer the question correctly. From the results of the tests used in class VIII in MTs N in Pekanbaru, 45.7% of students' answers were wrong in answering questions about understanding concepts.

The low understanding of students' concepts is inseparable from the process of learning mathematics. To develop students' understanding of concepts can be done by designing a learning that familiarizes students to construct their own knowledge. That way students better understand the concepts taught to students. Before the teacher starts the new learning, the teacher must pay attention to the extent to which students are able to understand the material prerequisites related to further learning. If the prerequisite material is well understood, it can be said that for the next material it will be easier for students to understand.

Initial ability is also a factor that influences the success of students in learning (Hasan, 2019; Riadi, 2019; Hayati, 2019).. Initial ability is all competencies that students should have mastered before they begin learning with new material. According to Wahyuni (2017) This initial ability describes the readiness of students to receive lessons to be delivered by the teacher. This ability can be in the form of students' understanding of the initial material (prerequisite material) that they must master before entering new material. According to Shodikin (2015) Ideas that arise often develop gradually so that the initial ability is sufficient enough to be able to build a comprehensive mathematical concept of information previously obtained. As an analogy, students who have a low initial ability will find it more difficult to acquire new knowledge or assimilate new concepts that come to him and associate with previous knowledge that is in him. While students who have high initial abilities will tend to easily receive information and associate with information that is in themselves so that the learning process occurs. In other words, in mathematics learning, teachers need to pay attention to students 'initial mathematical abilities in improving students' mathematical abilities.

In mathematics learning so far students are not used to exploring their own knowledge and finding solutions to problems. This is because students are accustomed to waiting for answers from teachers so that they seem passive in learning and students have not been able to understand the material provided by the teacher. The efforts made by the teacher so far have not achieved satisfactory results. To activate students in class, the teacher has asked students to group, but those who work on group assignments are only students who are smart in the group, while other students only receive results from friends without trying to actively complete the task. In reality, not all students can easily solve the problem, because in the class there are students who are capable of fast, moderate and lacking in understanding the lesson.

To overcome the problems in mathematics learning, one of the learning models which according to the authors is good to be applied is Cooperative learning type Student Teams Achievement Division (STAD). STAD type learning aims to enable students to work together and help each other in understanding and communicating mathematical questions within their respective groups. Taniredja (2011: 65) type STAD has 5 main components, namely: class presentations, teams, quizzes, personal enhancements and group awards.

To see the ability to understand students' concepts in mathematics learning, it can be seen from the indicators of understanding concepts. Indicators for understanding concepts according to NCTM (2000) include (a) restating a concept; (b) clarifying objects according to certain characteristics according to the concept; (c) give examples and non examples of concepts; (d) present concepts in various forms of mathematical representation; (e) developing necessary requirements or requirements for a concept; (f) applying problem solving algorithms or algorithms.

In this study, the indicators used to assess the ability to understand concepts are (a) restating a concept; (b) clarifying objects according to certain characteristics according to the concept; (c) applying problem solving algorithms or algorithms. There are several indicators that have been represented by other indicators, such as indicators that present concepts in various forms of mathematical representation, including indicators that clarify objects according to certain characteristics according to the concept. Other indicators are indicators of developing necessary requirements or sufficient requirements for a concept included in the indicators applying the problem solving algorithm or algorithm.

Based on these descriptions, the author wishes to conduct research with the title "The Effect of STAD Type Cooperative Learning on Understanding the Mathematical Concept of Class VIII Students of MTs N Pekanbaru". The formulation of the problems examined in this study are: (1) is the understanding of the mathematical concept of students who follow STAD type cooperative learning higher than the conceptual comprehension ability of students who take conventional learning? (2) is the understanding of the concept of high-ability early students taught by STAD-type cooperative learning higher than high-skilled students who are taught with conventional learning? (3) is the understanding of the concept of low-ability early students taught by STAD type cooperative learning higher than those of low initial ability taught by conventional learning?.

2. RESEARCH METHOD

This type of research is quasi-experimental research (quasi-experiment) because the class selected as a sample is already in the form of a group, researchers do not form groups anymore. The experimental class will get the STAD type cooperative learning model and the control group that gets conventional learning. The research design used is the Randomized Control Only Design design. Research design can be seen in table 1 below:

Table 1. Research Design.

Class	Treatment	Test
Eksperiment	X	T
Control	-	T

Source : Suryabrata (2004: 104)

Information:
X: Cooperative learning type STAD
Q: Test given to the experimental class and control at the end of the study

The population in this study which is the population are all Class VIII MTsN Pekanbaru students in the academic year 2012/2013. The sample in this study was taken two classes namely one experimental class and another as a control class. The class that

will be used in this study is class VIII Pekanbaru MTsN. Sampling is done by drawing using paper rolls. The paper reads the name of the school along with class VIII which becomes the population. The paper roll consists of 11 pieces, namely 7 classes at Simpang Tiga MTsN and 4 classes at Muara Fajar MTsN. The first class taken is class VIII.3 MTsN Simpang Tiga is designated as the experimental class and the next one is class VIII.4 MTsN Muara Fajar is defined as the control class.

The initial ability test is a test that the teacher uses to know students' initial abilities before entering new material. The initial ability test was also used to determine students based on their initial mathematical ability categories into both groups, namely groups of high-ability early students and groups of low-ability early students. Grouping students based on their initial abilities is based on the average score of the initial ability test of the experimental class and the control class, then the value is sorted from highest to lowest.
To get a good initial test, do the following steps:

a. Make a grid about the initial ability test
b. Arrange the initial ability test questions
c. Validate the initial ability test questions
d. Make revisions
e. Test the initial ability test
f. Conduct an analysis of the initial ability test questions

To get a good initial ability test question, then a problem analysis is carried out with the following steps: (1) Test the Validity of Item (2), 2) Distinguishing Power, (3) Index of difficulty in question, (4) Problem classification, (5) Test reliability

The final test is a test given to the sample class at the end of learning, which is useful for measuring the students' ability to understand concepts. The steps used in the final test are the same as the initial test. The final test used is in accordance with the indicators of the ability to understand the concept of this test in the form of a description. To see the understanding of students' mathematical concepts from the questions given, the scoring rubric for understanding mathematical concepts is used as shown in table 2 below.

Table 2. Scoring Rubric Understanding Mathematical Concepts.

Indicator	Score				
	0	1	2	3	4
Declare a concept	There is no answer	The answer is there, but it is not right to restate a concept	Able to reiterate a concept correctly but the answer is wrong	Being able to re-express a concept correctly but there are few wrong answers	The right answer, able to restate a concept correctly
Clarifying objects according to certain characteristics in accordance with the concept	There are no answers	Answers exist, but less precise Clarifying objects according to certain characteristics in accordance with the concept	Able to clarify objects according to certain characteristics according to the concept correctly but wrong answers.	Able to clarify objects according to certain characteristics according to the concept correctly but there are few wrong answers.	Correct answer, able to clarify objects according to certain characteristics according to the concept correctly
Apply problem solving algorithms or algorithms	No answer	The answer is there, but it is not right to apply the problem solving algorithm or algorithm	Able to apply concepts or algorithms to solve problems correctly but wrong answers	Able to apply concepts or algorithms to solve problems correctly but there are few wrong answers.	Correct answers, able to apply the concepts or algorithms to solve problems correctly

Source: Modifiction from Fauzan (2012:15)

3. RESULT AND DISCUSSION

The data of the research results described are data about the final test of students 'conceptual understanding, both overall and in terms of students' initial abilities taught by STAD type cooperative learning and conventional learning. Data about the test results understanding the mathematical concepts of the experimental class students and the control class both as a whole and those with high initial abilities and those with low initial abilities were obtained after the final test was conducted. Data on understanding concepts in the experimental class and control class can be seen in table 3.

Table 3.Distribution of Mathematical Concept Understanding Ability Test Results

Class	KA	N	$\bar{x}$	S^2	S	Xmax	Xmin
Eksperiment	High	24	21,96	10,82	3,29	28	15
	Low	16	16,56	14,40	3,79	22	10
	All	40	19,80	19,09	4,37	28	10
control	High	16	21,21	2,49	1,58	24	19
	Low	14	15,06	5,26	2,29	19	11
	All	30	17,93	13,58	3,69	24	11

From Table 3, it can be seen that the average test of understanding the mathematical concepts of students as a whole using STAD type cooperative learning is higher than the average conceptual understanding of students using conventional learning. The variance and standard deviation of the experimental class are higher than the control class, this means that the academic abilities of the experimental class students are more diverse than the control class.

The average test of understanding the mathematical concepts of high and low initial ability students in the experimental class is higher than the control class. Variance and standard deviation of the experimental class are higher than the control class. In other words, understanding the mathematical concepts of high and low initial ability students in the experimental class taught by STAD type cooperative learning is more diverse than the control class taught by conventional learning.

1) Normality test

The normality test was carried out on the test scores understanding the mathematical concepts of the experimental class students and control class students, both high-skilled students and low-skilled students. The normality test was carried out using the Kolmogorov-Smirnov test. From the results of the normality test, all the values of Sig. smaller than the real level (α = 0.05). This means that the concept understanding test value data is not normally distributed.

2) Hypothesis testing

Based on the sample class normality test, it is known that test data understanding of mathematical concepts of students is not normally distributed, so for testing hypotheses, non parametric statistics are used, namely by using the Mann-Whitney U test. This hypothesis test is used to determine whether understanding mathematical concepts of students participating in cooperative learning the STAD type is higher than the conceptual understanding of students who take conventional learning. Testing this hypothesis is done using the Mann-Whitney U test. It is obtained that the test results of understanding the mathematical concepts of students have Sig. <real level (α = 0.05) means reject H0. Thus it can be concluded that understanding the mathematical concepts of students who follow STAD type cooperative learning is higher than the conceptual understanding of students who take conventional learning.

To test the hypothesis of understanding the mathematical concepts of students with high initial abilities, it is used to find out whether the conceptual understanding of high-ability students who are taught by STAD type cooperative learning is higher than those of high initial students who are taught by conventional learning. Testing this hypothesis is done by using the Mann-Whitney U test. From the calculation it is obtained that the test results of understanding the mathematical concept have a Sig. <real level (α = 0.05) means reject H0. Thus it can be concluded that the understanding of the concept of high-ability early students taught by STAD type cooperative learning is higher than the high-skilled students who are taught by conventional learning.

To test the hypothesis the understanding of mathematical concepts of students with low initial abilities is used to find out whether the conceptual understanding of low-ability students who are taught by STAD type cooperative learning is higher than those with low initial ability taught by conventional learning. Testing this hypothesis is done using the Mann-Whitney U test. Based on the calculation, it can be seen that the test results of understanding the mathematical concept have the Sig. <real level (α = 0.05) means reject H0. Thus it can be concluded that the understanding of the concept of low initial ability students taught by STAD type cooperative learning is higher than the low initial ability students taught by conventional learning.

The results of understanding the concepts in the experimental class and the control class can be seen in the graph like Figure 1.

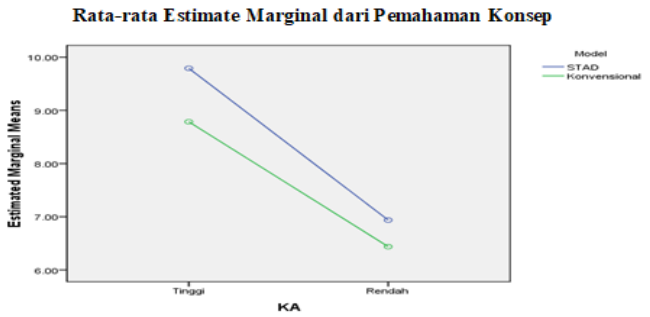

Figure 1. Graph of Students' Concept Understanding Ability

In Figure 1, it can be seen that the lines on the graph that show the value of the final test understand the concept of students in the experimental class and in the control class. Based on these images it can be said that the conceptual understanding of students who are highly capable in the experimental class is higher than those of high-ability students in the control class. This can be seen from the difference in the average difference between the experimental class and the control class is 0.75. In the picture it can also be seen that low-ability students in the experimental class are higher than those with low ability in the control class. This can be seen from the difference in the average difference between the experimental class and the control class is 1.5. From the statement above, it can be said that the conceptual understanding of students in the experimental class is higher than the students in the control class.

Discussion

In testing the first hypothesis it was found that understanding the concepts of students who were taught using the STAD type cooperative model was higher than conventional learning. This is because learning is done in both classes. STAD type cooperative learning prioritizes student activities during the learning process, learning like this will be more meaningful for students. In contrast to conventional classes, where the learning role of the teacher is more dominant in the learning process, so students tend to only receive information provided by the teacher so that they cannot understand the concepts that are well-studied.

Understanding the concept is more meaningful for students because they will share the award if they can solve the questions given by the teacher. This is in line with Lie's opinion (2007: 6) cooperative learning of two or more individuals depending on each other to get the same award.

Based on the initial ability, for the second hypothesis it was found that the conceptual understanding of students with high initial abilities who participated in learning with STAD type cooperative learning was higher than the conceptual understanding of students with high initial abilities in conventional classes. High-ability students have a very important role in the group, because it can help students understand the concepts that exist in the LKS problem.

To see the level of students' understanding of the questions given, it can be seen from the way students write their answers or write down the information obtained from the questions. Based on the answer sheet test high-ability students in the experimental class, students are generally able to provide answers or information from the questions that are done well. Figure 2 shows students in answering indicator number 1 which is clarifying objects according to certain characteristics according to the concept.

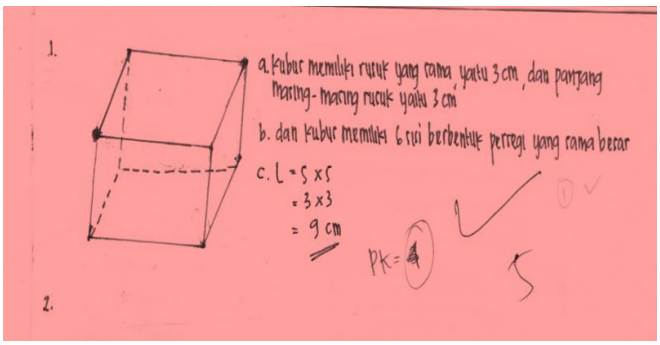

Figure 2. Answers of students who answered the indicator question no. 1 in the experimental class

Based on the answers of the students above, the student is able to understand the purpose of the problem. The first step taken by the student is to make the cube image correctly, then by knowing the concept that is on the cube, the student can clarify the

properties of the cube based on known information on the problem.

Unlike conventional learning, high-ability early students are accustomed to accepting and memorizing the concepts conveyed by the teacher in the learning process. The tendency to memorize makes students less understanding in answering questions. Figure 3 is a highly capable answer that is taught with conventional learning in working on the indicator number 1 which is clarifying objects according to certain characteristics according to the concept.

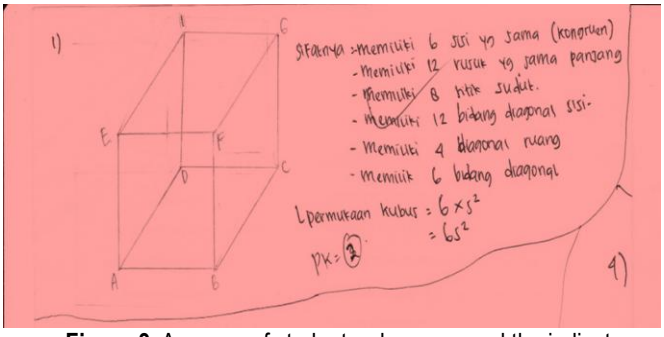

Figure 3. Answers of students who answered the indicator question no. 1 in the control class

By looking at figure 3 above, the student is able to draw the cube correctly, but because of the tendency to memorize, the student mentions all the properties in the cube without understanding that only the nature of the ribs and the width of the side are asked in the questions.

The results of the testing of the third hypothesis found that there is a conceptual understanding of students with low initial abilities who take part in learning with STAD type cooperative learning higher than the conceptual understanding of students with low initial ability in conventional classes. STAD type cooperative learning students learn in small groups that allow positive interactions between group members. Unlike conventional learning, students learn individually.

From the description of the understanding of the concepts that have been explained and based on the results of the final test average understanding of concepts of high-ability students as well as those with low initial abilities in the experimental class are higher than the final test comprehension concept of high and low initial students in the control class . With this, it means that there is the effect of the STAD type cooperative learning model on understanding students 'concepts, because given the treatment with STAD learning students become trained in solving problems that require understanding concepts so as to improve students' conceptual understanding. Thus it can be concluded that understanding the concept of high and low ability early students who attend STAD learning is higher than the conceptual understanding of students with high and low initial abilities who follow conventional learning.

4. CONCLUSION

Based on data analysis and discussion, it was concluded that:

a. understanding of the mathematical concept of students who follow STAD type cooperative learning is higher than the conceptual understanding of students who take conventional learning;
b. understanding the concept of high-ability early students who are taught by STAD type cooperative learning is higher than high-preliminary students who are taught by conventional learning;
c. understanding the concept of low-ability early students taught by STAD type cooperative learning is higher than low initial-capable students taught with conventional learning.

REFERENCES

Fauzan, Ahmad (2012) Mathematics Learning Evaluation Module. Matematika.net Evaluation: UNP.

Fitriana, D. A., & Supahar, S. (2019). Developing an Assessment Instrument of Mathematical Problem-Solving Skills in Senior High School. *International Journal of Trends in Mathematics Education Research*, *2*(3), 138-141.

Gilang, A.F, et al (2018) Increased Understanding of Mathematical Concepts Through Realistic Mathematic Education Assisted by Bongpas Props. ANARGYA: Scientific Journal of Mathematics Education, 1 (1) 14-20.

Hayati, T. R., & Kamid, K. (2019). Analysis of Mathematical Literacy Processes in High School Students. *International Journal of Trends in Mathematics Education Research*, *2*(3), 116-119.

Hasan, B. (2019). The Analysis of Students' Critical Thinking Ability with Visualizer-Verbalizer Cognitive style in Mathematics. *International Journal of Trends in Mathematics Education Research*, *2*(3), 142-148.

Lie, Anita. (2007) Cooperative Learning Practices Cooperative in Classrooms. Jakarta: Grasindo.

Mawaddah, S & Maryanti, R (2016). The Ability of Understanding Mathematical Concepts of Middle School Students in Learning Using a Guided Discovery Model (Discovery Learning). EDU-MAT Journal of Mathematics Education, 4(1), 76 – 85.

Misu, L., Budayasa, I. K., Lukito, A., & Rosdiana, R. (2019). Comparison of Metacognition Awareness of Mathematics and Mathematics Education Students Based on the Ability of Mathematics. *International Journal of Trends in Mathematics Education Research*, *2*(3), 124-127.

Mulyono, B & Hapizah (2018) Understanding of Concepts in Mathematics Learning. KALAMATIKA Journal of Mathematics Education. 3(2), 103-122

Nasution, S (2008) Various Approaches in Teaching and Learning. Jakarta: PT. Earth Literacy.

NCTM (2000) Curriculum and Evaluation of Standars for School Mathematics. Reston, VA: NCTM.

Netti, S., Khairul, K., & Amelia, P. (2019). Student's Mathematical Communication Skill Based on The Assimilation and Accommodation Framework. *International Journal of Trends in Mathematics Education Research*, *2*(3), 133-137.

Riadi, A., Atini, N.,L.,& Ferita, R. A. (2019). Thinking Skills of Junior High School Students Related to Gender. *International Journal of Trends in Mathematics Education Research, 2*(3), 112-115.

Sanjaya, Vienna (2008) Learning Strategies: Oriented Education Process Standards. Jakarta: Kencana Prenada Media Group

Shodikin, A. (2015). Interaction of Early Mathematical Capabilities of Students and Learning with Abdukti-Deductive Strategies on Enhancing Students' Mathematical Reasoning and Disposition Ability. Journal of Mathematics Education and Learning Innovation, 1 (1), 61-72

Slavin, Robert. (2005). Cooperative Learning; Theory, Research and Practice. Bandung: Nusa Media.

Suherman, Erman. (2003). Contemporary Mathematics Learning Strategy (REVISED EDITION). Bandung: Indonesian Education University.

Suryabrata, Sumadi. (2004). Research Methodology. Jakarta: PT Raja Grafindo Persada.

Wahyuni, P. (2017). The Effect Of Cooperative Learning Type Student Teams Achievement Division (STAD) On Understanding Mathematic

Concept And Comunication Class VIII MTs N Pekanbaru. Kutubkhanah journal 19 (1), 1-14.