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The Differences in Mathematics Learning Outcomes of Students Taught by Cooperative Learning Students Teams Achievement Division Type and Cooperative Learning Type of Group Investigation Model in High School

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Abstract. This study aims: 1) find out the results of students' mathematics learning with cooperative learning models of type STAD class X SMA 1 Watubangga; 2) find out the mathematics learning outcomes of students with the GI type cooperative learning class X at SMA Negeri 1 Watubangga; 3) find out the differences in mathematics learning outcomes of students who were taught using the STAD and NHT type cooperative learning models; 4) knowing the mathematical learning activities of students living in coastal areas. The populations in this study were all students (132) of class X SMA Negeri 1 Watubangga in the 2016/2017 academic year. Sampling was done using cluster random sampling technique as an experimental unit selected two research classes with a total sample of 67 students, namely one experimental class and one control class. The data collection techniques used were test and observation. To get a representative question, the validity and reliability were tested, while the data analysis techniques used were descriptive analysis and inferential analysis. Based on the data analysis, the conclusions obtained were $F_{count} = 1.29$ and at the level of 5% obtained $F_{table} = 1.806$, because $F_{count} < F_{table}$ then H_1 is accepted so that it can be concluded that the two variances are homogeneous and then tested using the t-test. At the level of 5% t table was 1.996 and t count was 1.56, and t count <t table then H_1 is rejected, with the acceptance of H_0 it can be concluded that there is no significant difference between the learning outcomes of mathematics taught by the STAD cooperative learning model and learning outcomes Mathematics students taught by the GI type cooperative learning model in class X of SMA Negeri 1 Watubangga.

1. Introduction

The low level of mathematics learning outcomes of students is in the aspect of answering the problem. Most of the students' answers do not match the final results of a problem, and the students often do not check the answers that have been done. One of the factors that cause students to feel that mathematics is a difficult lesson is because they lack the practice of working on the questions. One of the factors that caused students to feel that mathematics was a difficult lesson was that they were lack of working on the mathematical questions. They were more likely to play and help their parents, the majority of

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whom were fishermen. The factors that cause passive students in the learning process are embarrassed to ask and prefer to be silent, one of which is students are afraid to comment because students feel they do not get the opportunity to express their opinions.

Learning models that can engage students actively in learning are the Cooperative Learning Achievement Division (STAD) type and the Group Investigation (GI) type of cooperative learning model. The STAD type cooperative learning model is one of the motivational learning approaches that is believed to be able to increase students' motivation and results in learning. This method can be used as an alternative to create varied conditions in learning activities and help teachers to solve problems in learning, such as low student learning interest, low student learning activities or student learning outcomes. The STAD model uses teaching patterns for one class [1]

Some of the strengths of the STAD type cooperative learning model are (1) Students can learn from other students who are more understanding. So that the shame of asking questions about the material that students have not understood can be reduced; (2) Students can be active in solving problems given by the teacher; (3) Students must feel ready, because they will get a test by the subject teacher; and (4) In the assessment, the teacher can see the ability of each student to understand the material [2]

Another learning model that can improve student activity is the GI type cooperative learning model. This is possible because the GI-type cooperative learning model emphasizes students' awareness of the need to learn to apply knowledge, concepts, and skills to students in need or other members of the group so that GI type cooperative learning can be mutually beneficial between high-achieving students and low-achieving students. The benefits of GI type cooperative learning are that students will be more confident, motivated, respect individuals, and get better learning outcomes [3].

The advantages of cooperative learning model type Group Investigation are as follows a) student learning motivation is greater because of a sense of shared responsibility; b) groups are easier to see their shortcomings which need to be corrected immediately; c) in groups, more people think about the obstacles being faced; d) it provides opportunities for students to develop their potentials; e) it provides opportunities for students to more intensively conducting investigations on a certain topic; f) it helps students to develop their ability to interact with others; g) it helps students to develop students' good leadership skills [4].

The weakness of both models is that it requires a relatively long time to pay attention to the three STAD steps that take more time such as material presentation from the teacher, group work, and individual tests or quizzes [5]. While the GI learning model tends to involve students who can spend a long time [4] with such a long time, students who are not active in groups tend to talk about what they will do after school, such as playing on the beach or catching fish in the sea.

A research was conducted by Ernawita Rini Safitri (2018), with the title Application of Cooperative Learning Model Student Teams Achievement Division on Learning Motivation of Students at SMAN 8 Banda Aceh. The result showed that students' learning motivation before the application of STAD was (3.33%), and it increased to (96.7%). Based on n-gain in the high category before learning (18.75%), it increased to be (50%), based on attention indicators (85.13%), relevance (82.78%), evidence (80.09%) and satisfaction (62.83%). Based on the results of the study, it could be concluded that there was an increase in students' learning motivation through the application of the STAD cooperative learning model. This indicated that STAD could influence students to learn [6].

Haridi (2018) conducted research entitled Application of Group Investigation Learning to Improve Mathematics Learning Outcomes of Grade X Students of IPA 1 MAN 2 Banyuwangi. The result showed that: 1) there was an increase in motivation and mathematics learning activities through cooperative learning model type group investigation in class X students of IPA 1 MAN 2 Banyuwangi; 2) there was an increase in mathematics learning outcomes through the cooperative learning model group investigation type in class X IPA 1 MAN 2 Banyuwangi [7].

Another research was also done by Sumardi (2017) with the title Mathematics Learning with Student Achievement Division and Numbered Head Together Against Learning Outcomes Viewed from the Previous Ability of Middle School Students. The results showed that there were differences in influence between Student Team Achievement Division learning strategies and Numbered Head

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Together strategies on mathematics learning outcomes with a significance level of $\alpha = 0.05$. The learning outcomes of students who were treated by the Student Team Achievement Division's learning strategies were better than the learning outcomes of students who received the Numbered Head Together strategy treatment. According to the marginal mean, the mean of STAD learning outcomes was 73,6361 and the mean of NHT learning outcomes was 68,223. There was a difference in the influence of students' initial level of ability towards the learning outcomes of mathematics. There was an interaction between learning strategies and the level of students' initial abilities towards student learning outcomes [8].

The purposes of this study were to 1) find out the results of students' mathematics learning with cooperative learning models of type STAD class X SMA 1 Watubangga; 2) find out the mathematics learning outcomes of students with the GI type cooperative learning class X at SMA Negeri 1 Watubangga; 3) find out the differences in mathematics learning outcomes of students who were taught using the STAD and NHT type cooperative learning models; 4) knowing the mathematical learning activities of students living in coastal areas.

These two learning models generated students' motivation, demanding students to be more active in the learning process by practicing working on the problem, daring to express opinions, encouraging students to think, analyze and interact with teachers, and forming the good quality of human resources especially students who were part of coastal communities. In addition, this model can also help students to understand the mathematical concepts taught by teachers because students play a direct role in the teaching and learning process.

2. Method

This research was conducted in SMA Negeri 1 Watubangga in the XIA class in the odd semester 2017/2018 academic year on August 1, 2017, until August 16, 2017.

This study used experimental research using two experimental classes, namely, the STAD type cooperative learning model given in the experimental class 1 and the GI type cooperative learning model given in the experimental class 2.

The population in this study were all XIA class students of SMA Negeri 1 Watubangga in the first semester of the 2017/2018 academic year consisting of 4 classes with 132 students.

The data collection in this study uses test and non-test techniques. Tests are used to collect data relating to student mathematics learning outcomes in the form of essay tests. From the results of the post-test conducted on XIA class students with the results of manual calculations for the Pearson Product Moment correlation coefficient [8], a test is considered reliable if the results of measurements made using the test repeatedly on the same subject always show results that remain the same or are stable or steady (consistent). The data to be analyzed in this study is test data on students' mathematics learning outcomes using descriptive analysis and inferential analysis.

Descriptive statistics are statistics relating to how to describe data to be easily understood. Inferential statistics is a statistical technique used to analyze sample data and the results are applied to populations [10]. Before conducting a hypothesis analysis, the normality test and the data variance homogeneity test are carried out first. If the data is distributed normally, the test statistics used are parametric test statistics. While the data is not normally distributed, the test statistics used are non-parametric statistics. The normality test in this study is Kolmogorov-Smirnov with a significance level of 5%.[11]

3. Result and Discussions

3.1. Analysis of teacher activity observation sheets

The teacher observation sheet is used to see whether the teacher can carry out the learning process by the syntax present in the learning model, namely the STAD type cooperative learning model and the GI type cooperative. The results of the analysis of the observation sheet can be seen in the following figure 1.

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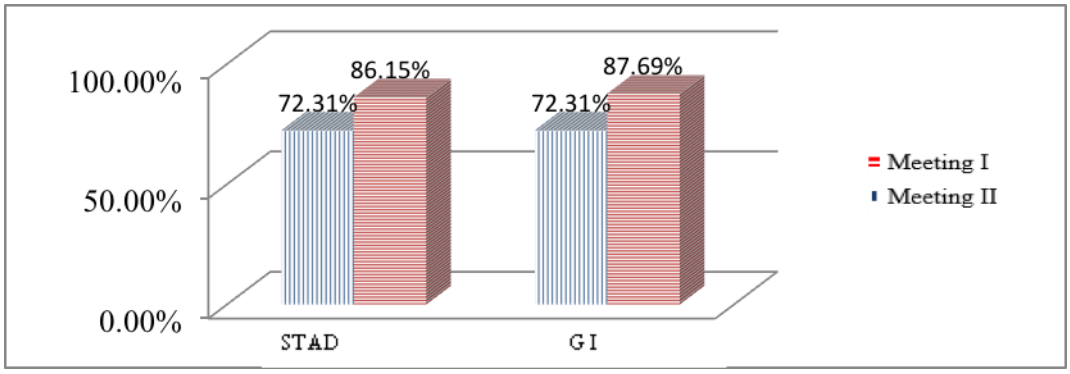

Figure 1. Results of analysis of teacher activity observation sheet the percentage of teacher activity in implementing STAD and GI type cooperative learning at each meeting belongs to the active category.

3.2. Analysis of student activity observation sheets

The results of the analysis of the observation sheet can be seen in the picture below.

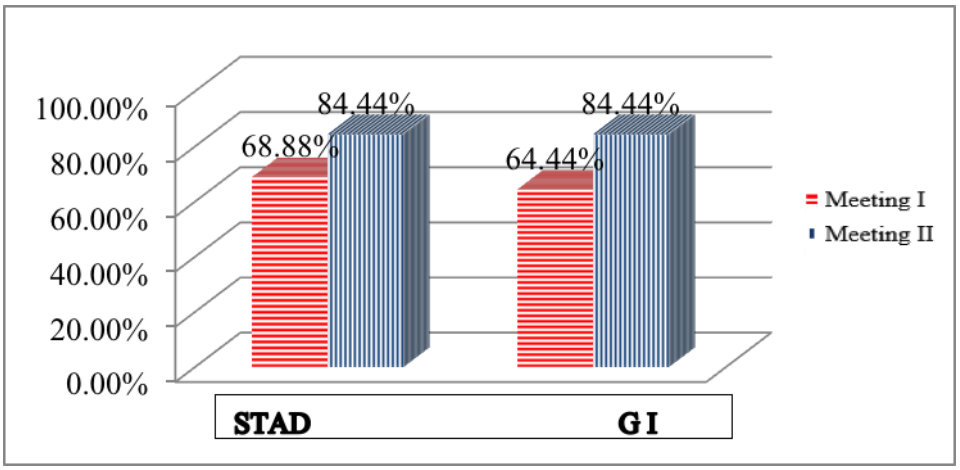

Figure 2. Results of Analysis of Student Activity Observation Sheets

3.3. Learning Outcome Data

The mathematics learning result of the students taught by using the STAD-type cooperative learning model can be seen in the following diagram (figure 3 and figure 4).

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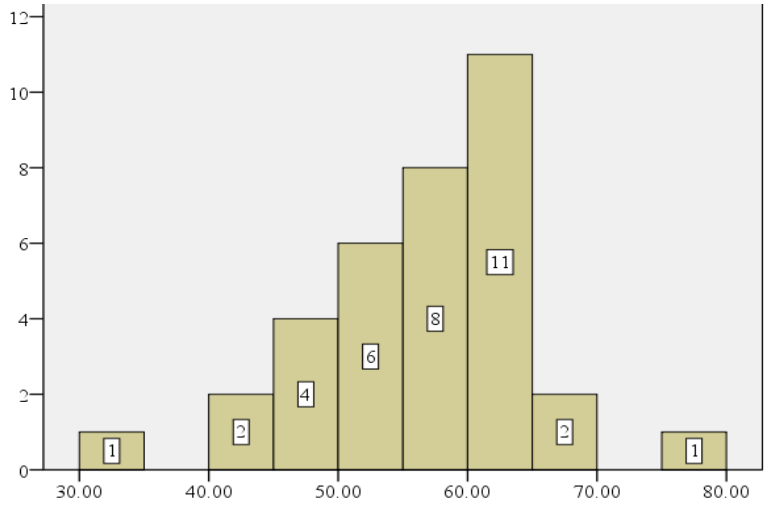

Figure 3. Analysis of Post-test Result Data of the Students Taught by Using STAD Model

The mathematics learning result analysis of the students taught by using a GI-type cooperative learning model can be seen in the following figure.

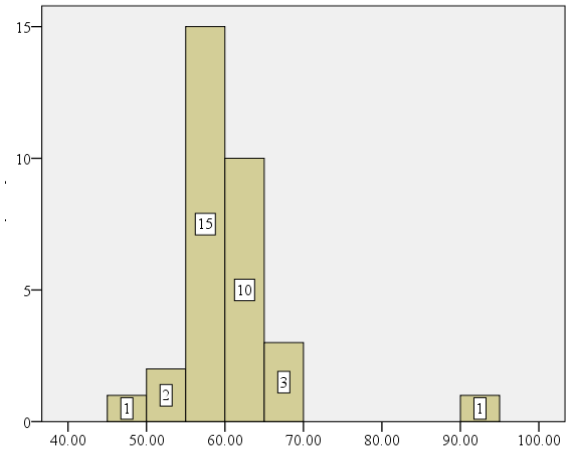

Figure 4. Post-test Result Data Analysis of the Students Taught by Using GI Model

The research result data is processed by using the statistical test result toward the hypothesis proposed in this research. Before conducting the test, assumption tests consisting of data normality test and variance homogeneity test were conducted.

3.4. Normality Test

The data normality test used is the Kolmogorov-Smirnov test. The data normality test result of the mathematics learning result of the students taught by using STAD and GI type of cooperative learning model based on the data of both student groups is presented in Table 1.

Table 1. Data normality test of the mathematics learning result of both student groups

Statistic	Learning Model	
	STAD	**GI**
N	35	32
Absolute	.147	.189

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KS-Z	.869	1.071
Sig.	.436	.202
H_0	Deverence	Deverence

Based on the table above, the mathematics learning result data of the students in both learning can be seen that the significance value is greater than 0.05 meaning that the H_0 is accepted. Therefore, the score data sample of the students' mathematics learning result in both learning comes from the normally-distributed population.

3.5. Homogeneity Test

The statistics formula used to test the variance homogeneity of both groups is:

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

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

The test criterion used is, if the probability value (sig.) is greater than $\alpha = 0.05$, $H_{0\ is\ accepted}$. Otherwise, H_0 is rejected. The variance homogeneity test used is F-test statistics.

Table 2. Variance Homogeneity Test of the Students' Mathematics Learning Result Data in Both Learning Groups

Statistic	Learning Model	
	STAD	GI
N	35	32
Standard deviation	8.59153	7.56217
S^2	73.814	57.1986
F_{test}	1.29	
H_0	Received	

The data variance homogeneity test from both classes taught by using STAD-type cooperative learning model and taught by using a GI-type cooperative learning model was done by using F-test. The results are as follow, $F_{count} = 1.29$ in the significance level of $\alpha = 0.05$ with $n_1 = 35$ and $n_2 = 32$, the F_{table} obtained is 1.806. Since F_{count} (1.29) < F_{table} (1.806), it can be concluded that the data variance of the students' mathematics learning outcome of experimental class 1 and experimental class 2 was homogenous.

3.6. Significance Test

The statistics formulas used to test the significance of the mean difference of both groups were:

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

The testing criteria used are, if the significance value is greater than $\alpha = 0.05$, the H_0 will be rejected, conversely, if the significance value is smaller than $\alpha = 0.05$, the H_0 will be accepted. The t-test analysis result toward the significance value of the students' mathematics learning result after being taught with the STAD-type cooperative learning model and GI-type cooperative learning model is presented in Table 3.

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Table 3. The Significance Test of the Students' Mathematics Learning Result between GI- type cooperative learning model and STAD-type cooperative learning model

Independent Samples Test						
	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	T	df	Sig.(2-tailed)	Mean Difference
Equal variances assumed	1.190	.279	-1.569	65	.122	-3.11491

Based on the analysis result of the data homogeneity test, both data were homogenous. Therefore, the Sig. value can be seen in the equal variances assumed row. The test result in that table was the Sig. value of 0.122 with t_{count} (-1.56) < t_{table} (1.996), thus H_0 was accepted and H_1 was rejected. Since H_0 was accepted, it can be concluded that there was no significant difference of the mathematics learning result between X.IA students of SMA Negeri 1 Watubangga taught by using STAD-type cooperative learning model and GI-type cooperative learning model.

3.7. The Difference of Mathematics Learning Result of Students taught by using STAD and GI type of cooperative learning model

Based on the research result, it was found that descriptively the learning result of the students taught by using STAD-type cooperative learning model consisting of 35 students showed the mean of 57.4257, approximately 20% of the students got the score ≤48.8, approximately 71% of the students got the score between 48.8 and 66., and approximately 9% of the students got the score more than 66.0. The median of the mathematics learning result of the students taught by using STAD learning model was on the score of 47.6.

The students taught by using GI-type cooperative learning model consisting of 32 students showed the mean of 60.5406, approximately 3% of the students got the score ≤ 52.9, approximately 91% of the students got the score between 52.9 and ≤ 68.1, and approximately 6% of the students got the score more than 68.1. The median of the mathematics learning result of the students taught by using GI-type learning model was in the score of 61.6.

Based on the analysis result, it can be descriptively seen that there was a difference in the mathematics learning result of the students of $X.IA_3$ of SMA Negeri 1 Watubangga joining the STAD-type cooperative learning and the students of $X.IA_4$ of SMA Negeri 1 Watubangga joining the GI-type cooperative learning.

The hypothesis test which used t-test with the significance value of $\alpha = 0.05$, it was obtained t_{count} (-1.56) > $\alpha = 0.05$, t_{table} (1.996). Since $t_{count} < t_{table}$, the hypothesis test by using t-test showed that H_0 was accepted, inferentially it means that there was no significant difference between the STAD-type cooperative learning model and GI-type cooperative learning model.

This happened because the students in Senior High School of Watubangga, where the majority of students live in coastal areas, were still unfamiliar with the new learning model, so that in the learning stages of STAD and GI, there were still some stages that were missing such as answering questions, spending relatively long time, and lack of utilization of the surrounding environment in order to maximize the potential of students living in coastal areas and like the playing world.

4. Conclusion

Based on the data analysis result and the discussion above, the test result of the table stated the (Sig). value of 0.122 with t_{count} (-1.56) < t_{table} (1.996). Therefore, H_0 was accepted and H_1 was rejected. Since

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H_0 was accepted, it can be concluded that there was no significant difference of the mathematics learning result between $X.IA_3$ students taught by using STAD-type cooperative learning model and $X.IA_4$ students taught by using GI-type cooperative learning model. In addition, based on the observation, the students' activities in the learning process were 84.44%, in the cooperative learning model STAD and GI types. It was classified as active. This showed that students who were in coastal areas were active when the learning process took place.

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