COMPARISON OF MATHEMATICS LEARNING OUTCOMES BETWEEN STUDENTS WHOSE LEARNING IS THROUGH THE NUMBERED HEADS TOGETHER (NHT) TYPE COOPERATIVE MODEL AND THE GROUP INVESTIGATION (GI) TYPE IN GRADE XI IPS OF SMA NEGERI 1 GOWA

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Abstract. This study aims to determinedifferences in mathematics learning outcomestaught through cooperative model of type Numbered Heads Together (NHT) with Group Investigation (GI) in class XI IPS SMAN 1 Gowa terms of value posttest. This study was an experimental study with this type of research Quasi experimental design (quasi-experimental). The population in this study were all students of class XI IPS SMAN 1 Gowa consisting of 3 classes numbered 102 people. Samples taken that class XI IPS 2 as the first experimental class taught using NHT type cooperative model and classTechnique Data collection is done by using an instrument that tests, Where the test is one aspect that is the post-test. The analysis technique used is descriptive statistical analysis and inferential statistical analysis. Descriptive analysis showed that learners are taught using NHT learning model with more gain in medium category and learners are taught GI model with more gain scores in the low category. While the results of inferential statistical analysis show that the two classes come from normally distributed population is not homogeneous with each - each posttest value calculation results obtained by the Sig (2-tailed) = 0.003 <α = 0.05, this means that there are differences in mathematics learning outcomes after being given treatment (posttest) between students who followed the experimental class 1 type of cooperative learning model Numbered Heads Together (NHT) and students who followed the experimental class 2 type of cooperative learning model of Group Investigation (GI).

Keywords: Cooperative Learning Model Group Investigation (GI), Cooperative Learning Model Type Numbered Heads Together (NHT), Math Results

INTRODUCTION

Mathematics is the most fundamental of all branches of science, playing a crucial role in various areas of life and is a subject taught in schools. It is also a tool for scientific thinking, essential for developing logical, systematic, and critical thinking skills in students. Mathematics scores play a crucial role in determining student graduation requirements, as mathematics is a compulsory subject on the national exam.

Mathematics learning is a process that involves various student activities/actions in learning mathematical concepts and structures, as well as the ability to solve mathematical problems, with the goal of achieving maximum learning outcomes. Among the factors that influence student learning outcomes are the methods used by teachers in delivering lessons and the students' learning process. The most important method, and the one most frequently used by teachers in classroom learning, is the lecture method.

Based on the results of the researcher's interview with mathematics teachers at SMA Negeri 1 Gowa on August 28, 2018, many teachers in mathematics learning still use conventional learning, which tends to be one-way, teacher-centered and less student involvement in the learning process. This conventional method causes students to have difficulty in understanding the concepts or materials given and ultimately the grades obtained

are less than optimal, some students even have not completed. This can be seen from the KKM completion criteria of 75. The nature of conventional learning like this does not stimulate students to understand what is being learned, so students do not have the ability to solve problems related to the learning material.

To address these issues, appropriate learning is needed, such as cooperative learning, which emphasizes student activeness, not just receiving. There are several types of cooperative learning, including Numbered Heads Together and Group Investigation.Because both learning models are group-based, making it easier for students to understand the material presented by the teacher. The reason for comparing the Numbered Heads Together and Group Investigation learning models is because both models are cooperative learning models. Furthermore, previous research has shown a significant influence between the two learning models, prompting researchers to explore this further.

In education, various learning models are known, one of which is cooperative learning. Cooperative learning refers to a learning method in which students work together in small groups and help each other learn. Cooperative learning emphasizes students learning to think, solve problems, and apply knowledge, concepts, and skills.

*Group Investigation*First developed by Sharan (Miftahul Huda, 2018:292), this Group Investigation learning model is a complex method in group learning that requires students to use high-level thinking skills. In existing theory, the Group Investigation learning model has three main concepts, namely: research, knowledge, and group dynamics. Research here is the dynamic process of students responding to problems and solving them. Knowledge is the learning experience obtained by students both directly and indirectly. Meanwhile, group dynamics is an atmosphere that describes a group interacting with each other involving various ideas and opinions and exchanging experiences through the process of mutual argumentation. According toEggen & Kauchak (Maimunah, 2005:21) state that group investigation is a cooperative learning strategy that places students in groups to investigate a topic. From this statement, it can be concluded that the GI method has a primary focus on investigating a specific topic or object.

The purpose of this study is (1) to determine the learning outcomes of mathematics taught through the application of the Numbered Heads Together type cooperative learning model to students of Class XI IPS SMA Negeri 1 Gowa. (2) to determine the learning outcomes of mathematics taught through the application of the Group Investigation type cooperative learning model to students of Class XI IPS SMA Negeri 1 Gowa. (3) to determine whether there are differences in the learning outcomes of mathematics taught by applying the Numbered Heads Together and Group Investigation type cooperative learning models to students of Class XI IPS SMA Negeri 1 Gowa.

Several studies related to GI and NHT are Larasati Tiara Meadyasari's (2012) study which concluded that the GI model of cooperative learning can increase student motivation in learning, increase students' active learning in constructing knowledge and develop students' social skills. Yusuf Jatnika's (2014) study concluded that there is an influence of the use of the Numbered Heads Together type of cooperative learning model on mathematical communication.

RESEARCH METHODS

The research used in this study was a quasi-experimental one. This quasi-experimental approach was used because the researchers wanted to manipulate variables by using treatments to compare two classes. Furthermore, both classes were evaluated to see changes or improvements in mathematics learning outcomes after receiving learning treatments using the Numbered Heads Together cooperative learning model and the Group Investigation learning model.

This experimental study consisted of two class groups: experimental group one and experimental group two. Experimental group one was given the Numbered Heads Together learning model, and group two was given the Group Investigation learning model.

The sampling method in this sampling technique is by randomly selecting classes from existing classes as a population. The samples are class XI IPS 2 as experimental class 1 taught using the Numbered Head Together (NHT) cooperative model and class XI IPS 3 as experimental class 2 taught using the Group Investigation (GI) cooperative model.

The instrument used in this study was a test. The test consisted of essay questions. The test was administered to Experimental Class I and Experimental Class II after treatment (post-test). The post-test was conducted to obtain data on students' mathematics learning outcomes after they were given the instruction.

The research data were analyzed quantitatively using descriptive and inferential statistics. This descriptive analysis was used to describe the mathematics learning outcomes obtained by students in order to obtain a clear picture of their mathematics learning outcomes. The statistical values that will be calculated are the average (mean), median, variance, standard deviation, and frequency distribution table. The collected data will be analyzed to determine the categories of student learning outcomes and student learning completeness, where the learning outcomes are categorized based on the categories compiled at school.

Inferential statistical analysis is performed to test the hypothesis. First, a prerequisite test is performed. If the prerequisite test is met, the hypothesis is tested using the Independent Sample Test. If not, the hypothesis is tested using a nonparametric test. The prerequisite tests are the normality test and the homogeneity test.

RESEARCH RESULT

The results and analysis of research data were made based on data obtained from research activities on student learning outcomes through the application of the Numbered Heads Together (NHT) cooperative model with the Group Investigation (GI) cooperative model that had been implemented at SMA Negeri 1 Gowa. This research was conducted for 4 meetings, where the first meeting to the third meeting provided lesson materials, namely the matrix sub-chapter through the application of the NHT type cooperative model and the GI type cooperative model in 2 different classes, and the last meeting was the administration of a posttest in the form of an essay test of 5 numbers.

This section will present the results of the analysis based on the research conducted. Two types of analysis are presented: those using descriptive statistics and those using inferential statistics. The descriptive analysis includes sample size, mean score, standard deviation, variance, score range, maximum score, and minimum score. Meanwhile, the

inferential statistical analysis includes requirements testing and hypothesis testing. The results of each data analysis are as follows:

1. Descriptive Statistical Analysis Results

a. Description of Students' Mathematics Learning Outcomes

The statistical analysis of the description of student learning outcomes is intended to describe the characteristics of research subjects after learning mathematics through the application of the NHT and GI type cooperative learning models.

1) Experiment 1

a) Description of Students' Mathematics Learning Outcomes After Implementing Numbered Heads Together (NHT) Learning.

This description is intended to provide an overview of students' mathematics learning outcomes after implementing the Numbered Heads Together (NHT) learning model in class XI IPS 2, which was selected as the research unit. The following presents the mathematics learning outcomes scores of class XI IPS 2 students:

Table 1 Statistics of Mathematics Learning Outcome Scores Students After Implementing Numbered Heads Together (NHT) Learning Type

Statistics	Statistical Value
Sample Size	34
Average Score	78.21
Standard Deviation	9,188
Variance	84,411
Score Range	54
Maximum Score	97
Minimum Score	43

Based on the data obtained in Table 1, it can be concluded that in general, students' mathematics learning outcomes after being given treatment (posttest) namely by applying the Numbered Heads Together (NHT) cooperative learning model in class XI IPS 2 of SMA Negeri 1 Gowa on matrix material are categorized as moderate. This is indicated by the average score achieved by students of 78.21 out of 34 students. The maximum score of students is 97 and the minimum score of students is 43.

If the posttest scores of students in experimental class 1 are grouped into five categories of learning outcomes, then the frequency and percentage distributions are obtained as shown in Table 2 below:

Table 2. Frequency Distribution and Percentage of Grade VIII.A Student Test Scores

No	Criteria	Category	Frequency	Percentage
1	$0 \leq \times < 60$	Very Low	1	2.9
2	$60 \leq \times < 75$	Low	7	20.6
3	$75 \leq \times < 85$	Currently	17	50

4	85 ≤ × < 95	Tall	8	23.6
5	95 ≤ × ≤ 100	Very high	1	2.9
	Amount		**34**	**100**

Based on table 2, it was found that of the 34 students of class XI IPS 2 of SMA Negeri 1 Gowa, there was 1 student with a very high percentage of 2.9%, 8 students with a percentage of 23.6% whose mathematics learning outcomes were in the high category and 17 students with a percentage of 50% were in the medium category, 7 students with a percentage of 20.6% were in the low category, and 1 student with a percentage of 2.9% was in the very low category.

2) Experiment 2

a) Description of Students' Mathematics Learning Outcomes After Implementing Group Investigation (GI) Learning

This description is intended to provide an overview of students' mathematics learning outcomes after the implementation of Group Investigation (GI) learning in class XI IPS 3, which was selected as the research unit. The following presents the mathematics learning outcomes scores of class XI IPS 3 students:

Table 3 Statistics of Mathematics Learning Outcome Scores Students After Implementing Group Investigation (GI) Type Learning

Statistics	Statistical Value
Sample Size	34
Average Score	67.68
Standard Deviation	16,283
Variance	265,135
Score Range	56
Maximum Score	88
Minimum Score	32

Based on the data obtained in Table 3, it can be concluded that in general, students' mathematics learning outcomes after being given treatment (posttest) namely by applying the Group Investigation (GI) type cooperative learning model in class XI IPS 3 SMA Negeri 1 Gowa on matrix material are categorized as low. This is indicated by the average score achieved by students of 67.68 out of 34 students. The maximum score of students is 88 and the minimum score of students is 32.

If the posttest scores of students in experimental class 1 are grouped into five categories of learning outcomes, then the frequency and percentage distributions are obtained as shown in Table 2 below:

Table 4 Frequency Distribution and Percentage of Grade XI IPS 3 Students' Test Scores

No	Criteria	Categor	Frequ	Perce

		y	ency	ntage
1	0 ≤ × < 60	Very Low	9	26.5
2	60 ≤ × < 75	Low	14	41.1
3	75 ≤ × < 85	Currentl y	4	11.8
4	85 ≤ × < 95	Tall	7	20.6
5	95 ≤ × ≤ 100	Very high	0	0
	Amount		**34**	**100**

Based on table 4, it was found that of the 34 students of class XI IPS 2 of SMA Negeri 1 Gowa, there were 7 students with a percentage of 20.6% whose mathematics learning outcomes were in the high category and 4 students with a percentage of 11.8% were in the medium category, 14 students with a percentage of 41.1% were in the low category, and 9 students or 26.5% were in the very low category.

2. Inferential Statistical Analysis Results

The results of the inferential statistical analysis are intended to answer the research hypothesis that has been formulated. Before conducting the inferential statistical analysis, prerequisite analysis tests are first carried out, namely the normality test and the homogeneity test.

a. Analysis Requirements Testing 1). Normality Test

The normality test aims to determine whether the average student mathematics learning outcome scores (posttest) are normally distributed. The test criteria are:
If$P_{value} > \alpha = 0{,}05$then the data is normally distributed
If$P_{value} < \alpha = 0{,}05$then the data is not normally distributed

a) Experiment 1

By using the Kolmogorov-Smirnov test, the calculation results onposttest value, namely. $P_{value} = 0{,}090 > \alpha = 0{,}05$The testing criteria are that the data is normally distributed if , so it can be concluded that the mathematics learning outcome score data of students (posttest) in the Numbered Heads Together (NHT) class is normally distributed.$P_{value} > \alpha$

b) Experiment 2

By using the Kolmogorov-Smirnov test, the calculation results onposttest value is .$p_{value} = 0{,}084 > \alpha = 0{,}05$The testing criteria are that the data is normally distributed if , so it can be concluded that the mathematics learning outcome score data for students (posttest) in the Group Investigation (GI) class is normally distributed.$P_{value} > \alpha$

2). Homogeneity Test

Based on the results of the population normality test, both experimental groups had normally distributed data, so a homogeneity test was conducted. The homogeneity test aims to

determine whether the variances of both populations are homogeneous (equal), meaning whether the samples used can represent the entire population. To test for homogeneity, a test of equality of variances was used on the posttest data of both samples.

Based on the results of the calculation of the homogeneity of population variance using SPSS version 22,for the posttest value, namely .$p_{value} = 0{,}002 < \alpha = 0{,}05$So it can be concluded that there is a difference in variance between the two groups (H1 is accepted).

b. Hypothesis Testing

After the results of the data testing of the two samples for experimental class 1 and experimental class 2 proved that the samples were normally distributed and had non-homogeneous variance, the data could then be used for hypothesis testing. Hypothesis testing was conducted to answer the formulated hypothesis.This hypothesis test was conducted using t-test statistics with Independent Sample T-test analysis.

Based on data analysisstudents' mathematics learning outcomes after treatment (posttest)by using Independent sample t-test, the results of the analysis show*Sig. (2-tailed)*= $0.003 < \alpha = 0{,}05$, soH0 is rejected. This meansthere is a differencemathematics learning outcomes in the knowledge aspect after treatment (posttest) betweenstudents who were taught through the application of the Numbered Heads Together (NHT) cooperative model with Group Investigation (GI) in class XI of SMA Negeri 1 Gowa.

Discussion

The research conducted at SMA Negeri 1 Gowa used two learning models, namely the Numbered Heads Together (NHT) type cooperative learning model implemented in class XI IPS 2 (experimental class 1) consisting of 34 students and the Group Investigation (GI) type cooperative learning model implemented in class XI IPS 3 (experimental class 2) consisting of 34 students.

This study was conducted in four meetings, three of which were used for learning activities using both cooperative models, and the final meeting was the administration of a posttest. In this study, learning using the Numbered Heads Together (NHT) and Group Investigation (GI) cooperative models was reviewed in terms of students' mathematics learning outcomes.

Based on the research results that have been described previously, then descriptively the average posttest results of experimental class 1 students who participated in learning with the cooperative model of the Numbered Heads Together (NHT) type were 78.21. Descriptively it is also known that the average posttest results of experimental class 2 students who participated in learning with the cooperative model of the Group Investigation (GI) type were 67.68. This is in line with the results of Elham Ghozoli's research (2016) which shows that the NHT learning model can improve mathematics learning activities and achievements with indicators of the ability to express thinking ideas during teaching and learning activities, activeness in asking questions to teachers in teaching and learning activities and the ability to discuss with study groups. In addition, the increase in student learning outcomes after the application of the NHT learning model is also supported by Sugandi's research (2013) which concluded that problem-based learning in the NHT cooperative learning setting has the greatest influence compared to the influence of conventional learning and problem-solving abilities and mathematical communication as well as students' learning independence.

Descriptively, it is also known that the average posttest result of experimental class 2 students who participated in learning with the Group Investigation (GI) cooperative model

was 67.68. This is in line with the research of Cristyani and Sudibyo (2012) who concluded that cooperative learning with the GI model can increase student motivation in learning, increase students' active learning in constructing knowledge and develop students' social skills needed for positive interactions in the classroom.

Based on the results of the research on the two experimental classes, researchers saw that students had better learning motivation when the NHT learning model was applied. This is because in the NHT learning model, students no longer fully expect the abilities of the smarter group members in each group because during the presentation the teacher will randomize the numbers to ask one of the numbers to present the results in front of the class so that inevitably each student must know the material being taught. Whereas in GI learning when asked to present their material they generally expect their group leader, and each group is asked to present their material so that some of each group member does not take a role because they hope for other friends.

Based on the inferential statistical analysis, the posttest value obtained was*Sig. (2-tailed)*= $0.003 < \alpha = 0{,}05$, then inferentially the students' mathematics learning outcomes differ significantly. Thus, it can be statistically concluded that the hypothesisH_0rejected andH_1accepted, this means that there is a difference in mathematics learning outcomes after treatment (posttest) between students in experimental class 1 who participated in learning with the Numbered Heads Together (NHT) cooperative model and students in experimental class 2 who participated in learning with the Group Investigation (GI) cooperative model. Where the learning outcomes of students taught with the NHT learning model are better than the learning outcomes with the GI learning model.

CONCLUSION

1. Mathematics learning outcomes of class XI IPS 2 students of SMA Negeri 1 Gowa after implementing the cooperative learning model type*Numbered Heads Together*(NHT)is in the moderate category with an average value of 78.21.
2. Mathematics learning outcomes of class XI IPS 3 students of SMA Negeri 1 Gowa after implementing the cooperative learning model type*Group Investigation*(GI)is in the low category with an average value of 67.68.
3. In the analysisinferential shows that there isdifferences in students' mathematics learning outcomes after treatment (posttest) between the two experimental classes.

SUGGESTION

Based on the conclusions above, the suggestions in this study are:

1. It is hoped that teachers who teach mathematics, in particular, can carry out the mathematics teaching and learning process using the NHT type cooperative learning model and the GI type cooperative learning model so that students can undergo a more interesting learning process.
2. It is hoped that schools can facilitate the implementation of various cooperative learning models such as the NHT type and the GI type so that teachers have choices in teaching a material.

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