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Application of the Group Investigation Type Cooperative Learning Model in Improving Students' Understanding of Mathematical Concepts

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Abstract

The purpose of this study is to determine the improvement of the understanding of mathematical concepts of students in the XI class of application at SMK Muhammadiyah Balangnipa through the application of a group investigation-type cooperative learning model. The type of research used in this study is classroom action research (PTK), with a quantitative research approach. The population in this study is all Class XI students at SMK Muhammadiyah Balangnipa totaling 6 people using the total sampling technique in sampling. The data collection techniques in this study are concept comprehension tests, and documentation. The data analysis technique in this study is a prerequisite test consisting of a normality test, a homogeneity test, and a hypothesis test. The application of the group investigation type cooperative learning model provides learning motivation for students, thereby increasing students' understanding of concepts in learning activities. The cooperative learning model of group investigation type is feasible to be applied in the learning process. This is shown from the results of the N Gain Analysis on the understanding of mathematical concepts, namely Frequency in the ineffective category as many as 1 person, fracture in the less effective category is 1 person, frequency in the effective category is 3 people, and frequency in the moderately effective category is 1 person.

Keywords: Cooperative Learning Model, Concept Understanding, Group Investigation

1. Introduction

Learning is identified with the word "teaching" which comes from the root word "teaching" which means instructions given to people so that they are known (followed) plus the prefix "pe" and the suffix "an" into "learning", which means the process, making, teaching or teaching method so that students want to learn. Many people still think that mathematics is less fun and difficult to learn. This is also based on the results of research conducted by Nani Restati Siregar which revealed that there are only a few people who say that mathematics is easy and fun. While people who perceive that mathematics is difficult and boring are few. In other words, learning is a process to help students learn well. (Djamaluddin & Wardana, 2019). Furthermore, most say that mathematics is a fairly difficult subject (Siregar, 2017). Because mathematics is considered a difficult and deceptive science (Fansi, 2020). Aryansyah (2021) stated that "Poor teaching methods will affect poor student learning. So that students are not happy with their lessons or teachers, as a result of which students are lazy to learn. The purpose of this study is to determine the improvement of the understanding of mathematical concepts of grade XI students at SMK Muhammadiyah Balangnipa through the application of a cooperative learning model of group investigation.

According to Sugiono, cooperative learning is a learning model that focuses on using small groups of students to work together to maximize learning conditions to achieve learning goals (Fiteriani, 2016).

Slavin (2009) stated that cooperative learning is peer learning where students work in small groups who have different backgrounds. The cooperative learning model is a form of learning in which students learn and work in small groups collaboratively consisting of four to six members with a heterogeneous group structure (Rusman, 2020). According to Lickona (2021) in her book entitled "Cooperative Learning and Fostering Conscience at Work: Character Education Series" states that the types of cooperative learning models include: Learning Pairs (*learning partner),* Group Seating Cluster Distribution (*Cluster group seating),* Team Learning (*Student team learning),* Jigsaw Learning (*Jigsaw learning),* Group Exam (*Team testing),* Small Group Projects (*Small-group project),* Team Competition (*Team competition),* Class Project (*Whole-class project).* The learning model used is a Group Investigation type Cooperative learning model. When viewed from each word, Group means "group, faction", while Investigation means "investigation". So, the Group Investigation type cooperative learning model means a cooperative learning model with an investigation conducted by the group (Bate'e, 2015). Hamdani explained that the group investigation model is a complex model, where students are involved starting from the planning stage, both in determining the hat and how to learn it through investigation (Hamdani, 2011). The group investigation model can train students to have responsibility for the job they choose because this model prioritizes student activities where students are given the freedom to think logically, creatively, reflectively, and productively (Nurhayati, 2014). Group Investigation learning is very well used to develop academic inquiry, social integration, and social processes in learning (Suastra, 2009). According to Narudin (in Shoimin, 2013) "group investigation is a form of cooperative learning model that emphasizes student participation and activities to find their own subject matter (information) to be learned through available materials, for example from textbooks or the internet". Group Investigation (GI) is one of the most complex types of cooperative learning (Wiranata et al., 2013). According to Wertheimer (2014) the implementation of the steps of the group investigation method can be stated as follows: topic selection, planning, implementation, analysis, presentation, evaluation. According to Sanjaya in the quote Nuhyal Ulia said that what is meant by concept understanding is the ability of students in the form of mastery of a number of subject matter, where students do not just know or remember a number of concepts learned, but are able to re-express in other forms that are easy to understand, provide data interpretation and be able to apply concepts that are in accordance with their cognitive structure (Ulia, 2016). Concept understanding is a person's ability to relate concepts or facts with the knowledge they have and be able to capture the meaning of a concept from what they have learned by re-describing what they have obtained into other forms. Concepts in mathematics are organized systematically, logically, and hierarchically from the simplest to the most complex, understanding mathematical concepts is the basis for learning mathematics meaningfully (Maure et al., 2020). Understanding mathematical concepts can be seen from several indicators, namely: Restating a concept; Classifying objects according to certain properties (according to their concept); Give examples and not examples of concepts; Use, utilize and select specific procedures or operations; Applying concepts or algorithms to problem solving (Manul et al., 2019).

2. Method

This research is a classroom action research (*Classroom Action Research*). This classroom action research (PTK) is carried out to improve the learning process. Therefore, this classroom action research focuses on actions in the learning process in the classroom. According to Kemmis and Mc Taggart's model, the research flow consists of four main activities, namely planning, implementation, observation, and reflection :(Djamaluddin & Wahdana, 2019)

The model can be described as follows

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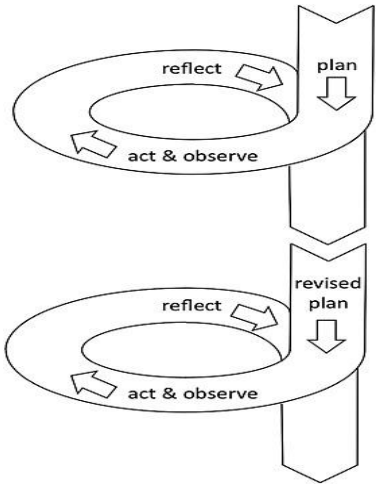

Source: :(Djamaluddin & Wahdana, 2019)

Figure 1
PTK Kemmis and Mc Taggar Models

The analysis used is a gain normality test. This test is used to determine the effectiveness of the treatment given. The following is the formula used to calculate the normality of gain according to Meltzer (Oktavia et al., 2019).

The effectiveness criteria interpreted from the normality value of gain according to Meltzer can be seen in the following Table 1.

Table 1. Classification of gain normality values:

Presentse (%)	**Interpretation**
<40%	Ineffective
40-55%	Less effective
56-75%	Quite effective
>76%	Effective

Source: Karinaningsih (2010)

3. Results and Discussion

Normality Test

Uij normality is carried out to find out whether the data is normally distributed or not. The normality test was carried out in this study with the aim of finding out the data that the results and learning interests of students in the Data Analysis course obtained were normally distributed. In this study, the normality test uses *Shapiro Wilk* with the provision of a significance level of > 0.05 using *the SPSS 25.0 for windows program*. The results of the calculation of the normality test of student learning results and interest in the course are as follows:

Table 2 Test Normality Test

***Test* of Normality**			
	Shapiro-Wilk		
Result	*Statistics*	*Df*	Sig.
Pre test	.908	6	.421
Post test	.907	6	.415

Source: Data results using SPSS 20.0

Based on Table 4.1 on the learning outcomes of students in the pre-test and post-test classes, the significance value of the *pretest score* was obtained which was 421 in the sig table. The significance value obtained is greater than 0.05 or 421 > 0.05 and for the significance value of the posttest, which is 415 in the significance table obtained, it is greater than 0.05 or 415 > 0.05. So it can be concluded that the learning outcomes of students in the classroom are normally distributed.

Homogeneity Test

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The homogeneity test is used to find out whether two or more data groups come from populations that have the same or homogeneous variation. The results of the homogeneity calculation using *the ANOVA one-way* test using the *SPSS 20.0 for windows program.* The homogeneous condition in the *ANOVA one-way test* is Sig > 0.05. The results of the homogeneity test are as follows:

Table 3 Homogeneity Test *of Class* Posttest

Test of Homogeneity of Variances

Learning outcomes

Levene Statistic	df1	DF2	Sig.
3.265	1	10	.101

Source: Data results using *SPSS 20.0*

Based on Table 4.2, the results of the *posttest* homogeneity test and the pre-test class obtained a significance value of 0.101 or 0.101 > 0.05 so that it can be concluded that the data comes from a population that has homogeneous variance.

N-Gain Test

The analysis used is a gain normality test. This test is used to determine the effectiveness of the treatment given.

Table 4 N-Gain

Categories of N-Gain interpretation

Presentse (%)	**Interpretation**
<40%	Ineffective
40-55%	Less effective
56-75%	Quite effective
>76%	Effective

Source: Arikunto (1999) in Arini

Ngain Category Towards the Concept of Mathematical Understanding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<40% = ineffective	1	38,9	38,9	38,9
	40-55%=less effective	1	5,6	5,6	44,4
	56-75%= quite effective	1	50,0	50,0	94,4
	>76%=effective	3	5,6	5,6	100,0
	Total	6	100,0	100,0	

Source: Data results using SPSS 20.0

Based on the table above, it is known that the N Gain categorization of the understanding of mathematical concepts is in the effective frequency category.

4. Conclusion

From the results of the research that has been explained in the previous chapter, it can be concluded that the application of the group investigation cooperative learning model can improve the understanding of mathematical concepts of grade XI students of SMK Muhammadiyah Sinjai. This is shown from the results of the hypothesis test which states the number 91.6 or seen from the category of N Gain Analysis on understanding Students' mathematical concepts are in the effective category.

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