

The Comparison of Students' Understanding Ability on Mathematics Concept by Using the Team Games Tournament Learning Model and Think Pair Share

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Abstract. This study aims to determine the comparative effectiveness of students' understanding of mathematical concepts by using the TGT type learning model and TPS type at Grade VII of SMP 4 Takalar. This study used a quantitative approach of quasi-experimental type research. The research participants were all students of Grade VII of SMP 4 Takalar which has 118 students. The data was taken by simple class random sampling technique which got a total sample of 60 people (The first experiment class and second experiment class). This research instrument used a descriptive test with criteria based on indicators of understanding ability concepts. Data analysis techniques used descriptive statistical analysis and inferential statistics, namely the independent sample t-test and gain test. Based on the results of descriptive analysis, it was shown that the ability to understand mathematical concepts of Grade VII of SMP 4 Takalar before using the TGT learning model had an average of 15.33 with a standard deviation of 3.7 and an average ability of the TPS model of 14.83 with a standard deviation of 2.7. Based on the standard deviation comparison, it showed that $F_{\text{count}} (1.37) < F_{\text{table}} (4.20)$ which means that students have the same initial ability before using the TGT and TPS models. The mean score of the post-test related to mathematical concept understanding of TGT students was 71.83 and the TPS model was 59.77. Based on inferential analysis, it was obtained $\text{Sig. } < \alpha = 0.002 < 0.05$. It means that H_0 was rejected; there was significant different ability of mathematical concept understanding at the seventh grade students of SMP 4 Takalar by using cooperative learning focusing on TGT and TPS types. Based on the results of the N-Gain percent test, it showed that the average N-Gain percent of the TGT model was 66.77% and the TPS model was 54.33%. Therefore, it can be concluded that learning mathematics using TGT is better than learning mathematics using TPS.

1. Introduction

An education in human life is very important. Therefore, education must be run as well as possible so that the results obtained can be in accordance with what is expected. National education goals derived from various cultural roots of the Indonesian nation which are contained in the National Education System Law, namely RI Law No. 20 of 2003, which states that national education aims to develop a potential of students to become human beings who believe in and have faith in God Almighty. In

addition, they are educated to be virtuous, healthy, knowledgeable, creative, independent, and democratic, and responsive [1].

Various improvement ideas to get a good change in running the education system have also been carried out by the government. One improvement in learning undertaken by the government is revising the KTSP curriculum to the 2013 curriculum. In the 2013 curriculum, mathematics curriculum is one of the basic subjects at each level of education which plays an important role in seeking students mastery in the ability to understand students' mathematical concepts, because mathematical concepts that are related to one another so that learning must be coherent and continuous. If students have understood mathematical concepts, it actualizes the students to learn other more complex mathematical concepts [2]. According to [3], understanding concepts is a student who is able to explain, find evidence, give examples and not examples, generalize, apply, and present concepts. Unfortunately, the implementation of learning in schools often faced with various problems, one of those is the low understanding of students in understanding concepts in mathematics.

Based on, the results of observations and interviews conducted by researcher to one of teachers at SMP 4 Takalar, the teacher stated that the process of learning mathematics is still conventional such using the lecture method and direct learning models. Thus, the students are less active in learning and students have difficulty in solving math problems, because of the lack of conceptual understanding. In this case, the teacher is the most active in learning at class. Based on the problem above, the researcher tried to change the attitudes of students who are passive into more active in the process of learning activities and develop students' understanding of mathematical concepts by using learning models that are suitable to be applied in research problems namely the TGT model. The TGT model makes students able to express his opinion, exchange opinions, and cooperate with each other. Thus, this could increase the student's interest in mastering mathematical material which indirectly improve the students' mathematical concept understanding. In addition, TPS is also one of learning models that can improve students' understanding of mathematical concepts. TPS model makes students independently searching for or finding a problem given from their teacher. Furthermore, the students could exchange opinions with their respective partners so that they can develop students' thinking to improve their mathematical concept understanding.

Based on the results of research conducted by [4], it explains that there are significant differences between student learning outcomes using the TPS learning model and TGT. Therefore, to overcome the above problems, the teacher must optimize the existence of students as objects and subject of learning at the same time, because students also need to be activated in learning activities. The way to overcome them is to use the TGT type cooperative learning model and TPS type.

According to [5], the TGT learning model is a cooperative learning model that is formed consisting of 4-5 heterogeneous students such as, academic, gender, race, or ethnicity. TGT learning model is a learning model in the form of groups in which there are games that can improve the ability to understand mathematical concepts. According to [6], the TPS type learning model is one of the effective learning models which is easy to implement and designed to influence student interaction patterns and increase the activity and collaboration. TGT learning model is a learning model in groups in which there are games that can improve the ability to understand mathematical concepts [7].

Therefore, researchers wanted to compare TGT type of cooperative learning model and type of TPS on understanding ability of students' mathematical concepts in this research, with the aim to know the description of TGT type of cooperative learning model, type of TPS and to find out whether there were differences between two learning models, namely TGT model and TPS model on the ability to understand students' mathematical concepts.

2. Method

The approach used by researchers is a quantitative approach to the type of research used was quasi-experimental conducted by comparing groups [8]. The research design used by researchers was non-equivalent control group design. This research was conducted at SMPN 4 Takalar with a population of

all objects studied, namely all VII class of SMPN 4 Takalar, totaling 118 students. The sample used is random with a simple random sampling technique, where according to [9] if the number of respondents is more than 100, then the sample is 10% -15% or 20% -25% or more. So the number of sample taken was as many as 60 students.

The instrument used in this study was a test of students' concept understanding ability in the form of a description item and was developed in accordance with the material to be studied such numbers. The indicators of students' mathematical understanding ability in this study consisted of 1) being able to explain verbally about what they had achieved, 2) being able to present mathematical situations in various ways and knowing differences, 3) being able to classify objects based on whether they were met or not the concept, 4) able to apply the relationship between concepts and procedures, 5) able to provide examples and cons of learned concepts, 6) able to apply algorithmic concepts , 7) Able to develop learning concept. The initial steps in compiling questions consist of 1) determining indicators of students 'mathematical concept understanding abilities, 2) arranging the grid based on indicators of students' mathematical concept understanding abilities, 3) making alternative key answers, 4) making scoring guidelines. The students' mathematical understanding ability test consists of pretest and post-test questions with the same relative difficulty level.

The instrument in this study was a test. Data analysis techniques were divided into 2 namely descriptive analysis techniques and inferential analysis techniques. Descriptive analysis techniques include frequency distribution tables, minimum, maximum, mean (mean), standard deviation, and variance. Meanwhile, inferential analysis used the t test with Independent sample t test, but the data normality test and variant homogeneity test were first carried out then proceed with the gain-normality test all using the help of the SPSS 20 program.

3. Results

3.1 The Level Description of Mathematical Concepts Understanding Using the TGT Model

The following is a table of results of descriptive analysis of data on the ability to understand mathematical concepts of students who use the TGT type learning model at SMP 4 Takalar

Table 2. Category Level of Understanding of TGT Class Fractional Operation Concepts

Level Of Mastery	Classification	Pretest TGT Class		Posttest TGT Class	
		Frequency	Percentage (%)	Frequency	Percentage (%)
0 – 18	Very low	22	73,33	0	0
19 – 36	Low	8	26,67	0	0
37 – 54	Moderate	0	0	3	10
55 – 72	High	0	0	13	43,33
73 – 90	Very High	0	0	14	46,67
Total		30	100	30	100

Based on table 2, it can be seen that the level of mastery of students' concept understanding ability for pretest questions; the very low category has the greatest frequency of 22 students or 73.33%. Meanwhile, the level of mastery of students' concept understanding ability for post-test questions; the very high category has the greatest frequency of 14 students or 46.67%.

3.2 The Level Description of Mathematical Concepts Understanding Using the TPS Model

The following is a table of results of descriptive analysis of data on the ability to understand mathematical concepts of students who use the TPS type learning model for students of class VII of SMPN 4 Takalar. Table 3. Category of the Concept understanding of Fraction Operations in TPS Class.

Table 3. Category Level of Understanding of TPS Class Fractional Operation Concepts

Level Of Mastery	Classification	Pretest TGT Class		Posttest TGT Class	
		Frequency	Percentage (%)	Frequency	Percentage (%)
0 – 18	Very low	30	100	0	0.00
19 – 36	Low	0	0	0	0.00
37 – 54	Moderate	0	0	13	43,33
55 – 72	High	0	0	10	33,33
73 – 90	Very High	0	0	7	23,34
Total		30	100	30	100

Based on table 3, it can be seen that the level of mastery of students' concept understanding ability for pretest questions, the very low category has the greatest frequency of 30 students or 100%. While the level of mastery of students' concept understanding ability for posttest questions, the medium category had the greatest frequency, namely 13 students or 43.33%.

3.3 The Ability differences to Understand Mathematical Concepts of Students Using the TGT Model and the TPS Model

3.3.1 Differences in TGT and TPS Class Pretest

The independent-sample t-test analysis of the TGT class pretest and the TPS class pretest aims to find out whether there is a significant difference in the pretest value in the TGT class and TPS class. H_0 is accepted if the significance level is 5% and the value of $p > 0.05$. The summary of the Pretest t test for TGT class and TPS class is shown in the following table 4:

Table 4. Summary of t Test Results for TGT Class and TPS Class (Pretest)

Class	Mean	Sig. (2-tailed)
Pretest TGT Class	15.33	0.101
Pretest TPS Class	11.83	

Based on table 4, it is shown that the average pretest ability to understand mathematical concepts of students who use the TGT model is 15.33 and the average mathematical understanding abilities of students who use the TPS model is 11.83. After analyzing the independent sample t-test for both classes, it is known that the significance value is 0.101 with a significance tarf of 0.05, which means that H_0 is accepted because $0.101 > 0.005$. Therefore, it can be concluded that there is no difference in the average initial ability of students' understanding of mathematical concepts between the TGT class and the TPS class.

3.3.2 Differences between TGT Class and TPS Class (Posttest)

Independent-Sample t-test test on the TGT class post-test and TPS class post-test aims to determine whether there is a significant difference between the post-test scores in the TGT Class and TPS Class.

H0 is declared rejected if the significance level is 5% and the value of $p < 0.05$.. The summary of the post-test t test of the TGT Class and TPS Class is shown in the following table 5:

Table 5. Summary of t Test Results for TGT Class and TPS Class (Posttest)

Class	Mean	Sig. (2-tailed)
Posttest TGT Class	71.83	0.002
Posttest TPS Class	59.77	

Based on table 5, it is known that the average posttest ability of understanding mathematical concepts of students who use the TGT model is 71.83 and the average mathematical understanding ability of students who use the TPS model is 59.77. After analyzing the independent sample t-test for both classes, it is known that the significance value is 0.002 with a significance tarf of 0.05 which means that H0 is rejected because $0.002 < 0.005$. Therefore, it can be concluded that there were differences in the average initial ability of students' understanding of mathematical concepts between the TGT class and the TPS class.

3.4 Normalized Gain Analysis

Normalized gain test of the TGT and TPS learning modes was conducted to find out what percentage of the effectiveness of the two models in improving students' understanding of mathematical concepts and which were more effective than the two models. The summary of the results of the t-test for N-Gain values is shown in the following table 6:

Table 6. Summary of the T-Tests for N-Gain Percentage

	Class	N	Mean	Sig.	Sig.(2-tailed)
NGain_Persen	TGT Class	30	66.7742	0.204	0.004
	TPS Class	30	54.3387		

Based on table 6 above, it can be seen that the average value of NGain Percent for TGT Class is 66.77 or 66.8%. Then it can be concluded that based on the interpretation of the effectiveness of the N-Gain value (%) this value indicates that the use of the TGT learning model is quite effective in improving students' understanding of mathematical concepts. Meanwhile, the TPS learning model can be seen that the average N-Gain percent value obtained is 54.33 or 54.3% which means that the TPS model is less effective in improving students' understanding of mathematical concepts. Meanwhile, based on table 8 above, it can also be seen that the significance value of $0.204 > 0.05$ which means that the data variance of the two models is homogeneous. While the value of sig. (2-tailed) of $0.004 < 0.05$. This means that there are significant differences in effectiveness between the two models. Therefore, it can be concluded that the TGT learning model is better and more effective than the TPS learning model.

4. Discussion

4.1 Ability to Understand Mathematical Concepts Using The TGT Models

Before applying the TGT learning model, the category of students' mathematical concept comprehension ability was only in the very low, and low categories. After applying the TGT learning model students' mathematical concept understanding ability, the medium category consisted of only 3 students with a percentage of 10%, the high category consisted of 13 students with a percentage of 43.33%, and in the very high category consisted of 14 students with a percentage of 46.67% and there are no students who have the ability to understand mathematical concepts in the very low or low categories. Hence, it can be

concluded that the largest percentage in the pretest is in the very low category (73.33%) while the largest percentage in the posttest is in the very high category (46.67%).

This is in line with [10] in a study which explains that students are enthusiastic and actively participate in learning using the TGT learning model so that the learning outcomes obtained by students also increase after using the TGT learning model.

After using the TPS model, students experience a significant attitude change which shown by an active learning environment in completing exercises and discussions between students and teachers [11]. TGT learning model affects student creativity in learning mathematics [12], because in the TGT model, students more enjoy the learning process and students learn by playing games which assessed individually through the games they do. This method can help students to develop their mathematical concept understanding skills especially for students who have fear or shame to ask their teacher about the material that they do not understand. In addition, students can also freely express ideas that are owned and conveyed to other group members without any sense afraid of being wrong because the learning process is based on a game.

4.2 The ability to Understand Mathematical Concepts Using The TPS Models

Before applying the TPS learning model, the category of students' mathematical concept comprehension ability was only in the very low category. Meanwhile, after applying the TPS learning model, students' ability to understand mathematical concepts in the medium category consisted of 13 students with a percentage of 44.33%. The high category consisted of 10 students with a percentage of 33.33%. The very high category consisted from 7 students with a percentage of 23.34% and none of the students had the ability to understand mathematical concepts in the very low and low categories. Hence, it can be concluded that the largest percentage in the pretest is in the very low category (100%) while the largest percentage in the posttest is in the moderate category (43.33%).

This is in line with [6] in his research which explained that the application of the TPS learning model can improve student achievement. This situation can emerge, because by using the TPS learning model students will work together to discuss mathematical ideas, solve problems, look for patterns and relationships in data sets, and make students actively exchange ideas with other students. Besides, they help each other to understand the material taught, so students are able to write information and problems contained in a problem. By discussing, students are also able to use mathematical terms and notation to model a mathematical problem. In line with [13] in their research, they explained that student achievement on geometry after applying the TPS model showed a significant improvement, because in the TPS model, the students were actively involved during the learning process. The TPS model helps teachers and students in various ways so as to have a positive impact on the development of teacher and student learning in the classroom, students are also increasingly motivated to interact cooperatively with their friends so as to create a pleasant learning environment [14]. The TPS learning model also has a positive influence in increasing students' self-efficacy in learning mathematics [15]. Besides, By a lot of opportunities for discussion, students also become aware of the purpose of the problem not only by counting the numbers but also knowing the meaning of each step in solving the problem until drawing conclusions.

4.3 The Average Mathematical Understanding Ability Differences of Students Using the TGT Learning Model and TPS Learning Model

Based on the results of the t test calculations, it can be concluded that there are differences in mathematical understanding abilities between classes using the TGT learning model and the TPS learning model. This is evidenced in the Independent sample sample t test which explains that the average understanding of mathematical concepts of TGT class students is greater that is 71.83 while the average understanding of mathematical concepts of TPS class students is only 59.77 with a significance of $0.002 < 0.05$.

This is in line with the results of Andriani's study (2013), he states that there are significant differences in student learning outcomes using the TGT and TPS models. This can happen, because in the implementation of the TPS learning model requires each student in each pair to equalize opinions or discuss with their partners about the problems given and the problems given by students themselves who find the problem then share or share with other friends. Meanwhile, the TGT type learning model students are formed in teams or groups of 4-5 students and more members than the TPS model so that students are better able to understand the learning provided. On the contrary, the TPS model where students in a group take care of the material taught without any explanation at the beginning of the teacher while the TGT model has an explanation at the beginning given to the teacher or an explanation of the material to be discussed.

4.4 The Effectiveness Comparison of TGT Learning Model and the TPS Learning Model

To find out how the effectiveness of the TGT and TPS learning models in improving students' mathematical understanding abilities, it can be done by testing two normalized gain average rates. Based on the results of the N-Gain t-test, it is known that there is a significant difference between students' mathematical understanding abilities using the TGT learning model and the TPS learning model and increasing students' mathematical understanding ability using the TGT learning model is higher than the TPS learning model. Therefore, it can be concluded that the TGT learning model is more effective than the TPS learning model with the percentage of TGT classes at 66.77% and the TPS model 54.3%.

5. Conclusion

The conclusion Based on the results of previous studies and discussions, the following conclusions are obtained:

- Ability to understand mathematical concepts of Grade VII of SMP 4 Takalar students who use the TGT learning model around 46.67% are in the very high category and the rest are in the high and medium categories.
- Ability to understand mathematical concepts of Grade VII of SMP 4 Takalar who use the TPS learning model around 43.33% are in the medium category and the rest are in the high and very high categories
- There is an average difference in the ability to understand mathematical concepts between the Grade VII of SMP 4 Takalar who use the TGT and TPS learning models. This is known based on the results of the t test which states that the average understanding of the mathematical concept of the TGT model is 71.83 while the average TPS model is 59.77.
- The TGT learning model is better and more effective than the TPS learning model in improving students' mathematical understanding abilities. This is known based on the results of the t test which states that the average N-Gain Percentage of the TGT model is greater than the TPS model that is 66.8% and the TPS model is 54.3% with a sig value. (2-tailed) of 0.004.

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