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Effect Teams Game Tournament Model Assisted by Plickers Applications Media on The Understanding Mathematics Concepts

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Abstract

This study aims to analyze the effect of the Teams Games Tournament (TGT) model assisted by Plickers application media on the understanding of mathematical concepts of class XI students of SMA Negeri 10 Bengkulu City.This type of research is a quasi experimental research with a non-equivalent pretest-posttest control group design. The population in this study were all eleventh grade students of SMA Negeri 10 Bengkulu City in the 2023/2024 academic year. The sample of this study was taken using purposive sampling technique in which XI MIPA 3 class totaling 20 students as an experimental class taught using the Teams Games Tournament (TGT) model assisted by Plickers and XI MIPA 2 class totaling 32 students as a control class taught with a direct learning model. Data collection was carried out with a mathematical concept ability test instrument. The hypothesis test results show that the value sig. (2-tailed) is 0.000 < α= 0.05 and supported by 0.581 with moderate category. Therefore, it can be concluded that there is a significant effect of the Teams Games Tournament model assisted by Plickers application media on the ability to understand mathematical concepts of class XI students of SMA Negeri 10 Bengkulu City.

Keywords:*Teams Games Tournament (TGT), Plickers, Mathematical Concepts Understanding*

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Introduction

Mathematics learning is an effort by teachers to encourage students to improve their understanding of mathematics (Abi et al., 2022:2). According to (National Council of Teachers of Mathematics, 2000:16) mathematics learning requires a strong understanding of what is needed to be learned in order to successfully meet learning requirements. One of the objectives of the mathematics learning curriculum listed in Permendiknas Number 22 of 2006 (Yuliyanto et al., 2019:75–76) is "Understanding mathematical concepts, explaining the relationships between concepts and applying concepts or algorithms, flexibly, accurately, efficiently, and appropriately in solving problems". The ability to understand mathematical concepts is one of the abilities that students must have in mathematics learning, based on the objectives of mathematics learning.

Mathematical conceptual understanding includes students' ability to master the material, understand the concept in depth, and be able to apply it in mathematical learning situations well (Yuliani et al., 2018:94). The application of this conceptual understanding can cover various topics in the curriculum and has a significant impact on various aspects of education (Mills, 2016:546). Furthermore, NCTM (The National Council for Teachers of Mathematics) emphasizes the importance of teaching conceptual understanding in mathematics on the grounds that in the 21st century, students need to have conceptual understanding to develop and become individuals who are able to solve problems in an ever-changing environment (Rahmat et al., 2018:16). This statement strongly reinforces the fact that conceptual understanding is closely related to mathematics learning, especially to keep up with the times. So, it means that students are accustomed to being able to understand something correctly.

Interviews with mathematics teachers at SMA Negeri 10 Kota Bengkulu showed that students still lack understanding of concepts in learning. The final semester assessment of class XI SMA Negeri 10 Kota Bengkulu only reached 60.33. The Minimum Completion Criteria (KKM) given by the school for mathematics learning for class XI is 76. Of the 224 class XI students, only 78 students have achieved KKM (34.21%) and 146 students have not achieved the KKM score (65.79%). Meanwhile, the results of observations stated that there were problems with students having difficulty working on questions that were different from the example questions given. To achieve good mathematical abilities, it is important to master a good understanding of mathematical concepts. Understanding mathematical concepts is the main foundation for achieving satisfactory learning outcomes in the final evaluation.

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One effort that can be made to overcome these problems is to apply a more interactive learning model and actively involve students in the learning process. A learning model is a conceptual framework used to design and implement the learning process, organizing learning experiences with the aim of achieving certain skills or learning objectives. In addition, the learning model also functions as a guide in the learning process by providing systematic learning steps (Suprihatiningrum, 2017:142). There are various types of learning models, including the cooperative model of the Teams Games Tournament (TGT) type.

The Teams Games Tournament (TGT) model is a cooperative learning strategy developed by De Vries and Slavin in 1978 at John Hopkins University. The purpose of this model is to help students review and master the subject matter in a teamwork and game-oriented manner. Slavin found that the implementation of TGT successfully improved basic skills, academic achievement, positive interactions between students, self-esteem, and attitudes of acceptance towards students with differences (Nurhayati & Marliani, 2019:408). The TGT learning model can encourage student involvement in the subject matter, thus changing students who were initially passive to active in the learning process (Rahmi et al., 2021:135).

The TGT learning model is a cooperative learning model that is different from other cooperative models. The difference between the TGT model and other cooperative models lies in the tournaments carried out by students. The series of tournaments in the TGT model are students competing with each other to get the highest score and students must compete with other students who have the same academic abilities. In addition, games and academic tournaments increase students' enthusiasm for learning and create a positive competitive atmosphere for students. This makes students happy and not bored in learning because students are given strategies and arrangements to compete (Rosidin, 2019:13).

With the development of the times, various media have emerged to support the learning process, one of which is Plickers. Plickers is an application on a smartphone or mobile device and is available in the form of a website. Plickers is a tool used by teachers to provide assessments and collect real-time data from assessment results by creating a pleasant atmosphere (Yunita et al., 2021:96). Based on the results of research conducted by Solmaz & Cetin, (2017:31) stated that the interactive media that is most liked by students is Plickers. Plickers provides an opportunity for students to play an active role in the learning process because the form of assessment is packaged like a game.

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The influence of the TGT learning model on students' mathematical concept understanding ability needs to be observed and evaluated because it helps in ensuring that the adopted learning approach provides the desired results and is in accordance with educational objectives. The results of previous studies show that TGT type cooperative learning assisted by online game media can improve students' mathematical concept understanding and reasoning abilities (Rohmah & Wahyudin, 2019:126). The results of other studies also show that there is a significant influence of the TGT learning model assisted by teaching aids on students' mathematical concept understanding abilities (Rahmi et al., 2021:134). This model is a cooperative learning model where students discuss in order to get information or knowledge and practice before competing (Ariani & Agustini, 2018:70).

Research Method

Types of research

Quantitative methods were used in this study with a quasi-experimental model.

Time and Place of Research

This research was conducted at SMA Negeri 10 Bengkulu City in the even semester of the 2023/2024 academic year from May 6 to May 22, 2024.

Population and Sample

Students of class XI of SMA Negeri 10 Kota Bengkulu became the population of this study. The sample determination process used purposive sampling technique. Students of class XI MIPA 2 and XI MIPA 3 were the samples in the study.

Procedure

This study began with an observation at SMA Negeri 10 Kota Bengkulu. In this study, there were two groups, namely the experimental group and the control group. The direct learning model was used by the control class, while the experimental class used the Teams Games Tournament (TGT) learning model assisted by the Plickers application media. The research design scheme is shown in the following table:

Table 1. Quasi-Experimental Research Design

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Class	*Pre-test*	Treatment	*Post-test*
Experiment	*O1*	X	*O2*
Control	*O3*		*O4*

Source:(Lestari & Yudhanegara, 2015:139)

Data collection technique

In this study, the researcher used data collection techniques through interviews and tests of students' conceptual understanding. The test was given in the form of descriptive questions with scores given according to the level of achievement based on students' answers in written sheets divided into pretest and posttest.

Data Analysis Techniques

Descriptive analysis was conducted to see students' mastery of concepts. The data obtained consisted of the average, variance, standard deviation, maximum and minimum values of students. In addition to descriptive analysis, inferential analysis was also conducted to see the homogeneity, normality of data and conduct a t-test to see the effect of Teams Games Tournament (TGT) learning assisted by Plickers application media on the conceptual understanding ability of class XI students at SMA Negeri 10 Kota Bengkulu. The research hypothesis is as follows:

$H_0 : \mu_1 = \mu_2$; There is no influence of the use of the Teams Games Tournament (TGT) learning model assisted by the Plickers application media on the understanding of mathematical concepts of class XI students of SMA Negeri 10 Bengkulu City.

$H_1 : \mu_1 \neq \mu_2$;There is an influence of the use of the Teams Games Tournament (TGT) learning model assisted by the Plickers application media on the understanding of mathematical concepts of class XI students of SMA Negeri 10 Bengkulu City.

The decision-making criteria for testing the data are as follows:

1. If the significance value < 0.05 then it is rejectedH_0
2. If the significance value ≥ 0.05 then it is acceptedH_0

Results and Discussion

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Based on the results of the research that has been conducted, experimental class data was obtained, as well as a description of the mathematical concept understanding ability test in Table 1 below:

Table 2. Description of Concept Understanding Ability of Experimental Class

Statistics	Experimental Class	
	Pretest	*Posttest*
Many Students	30	30
Average	52.33	80.17
Median	52.50	80
The highest score	75	95
Lowest Value	30	65
Standard Deviation	12,438	7.25
Variance	154,713	52,557
Skewness	-0.375	-0.353

Based on Table 2. it can be seen that the average pretest mathematical concept understanding ability of experimental class students is still below the KKM, which is 52.33. After being given treatment, the average mathematical concept understanding of students increased by 53.20%. The standard deviation of the data in the experimental class from pretest to posttest decreased, meaning that there was a change in students' concept understanding ability before and after the treatment was given.

As for the description of the mathematical concept understanding ability test for the control class, it can be seen in Table 3.

Table 3.Description of Control Class Concept Understanding Ability

Statistics	Control Class	
	Pre-test	*Post-test*
Many Students	32	32
Average	50.16	63.59
Median	50.00	65.00
The highest score	70	80
Lowest Value	35	50
Standard Deviation	9,712	9.09
Variance	94.33	82,636
Skewness	0.376	0.241

Based on Table 4.3, it can be seen that the average ability to understand mathematical concepts of control class students before and after being given treatment has not yet reached the KKM. The description of the control class data shows that the standard deviation of the

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pretest-posttest is almost the same, which means that there is almost no change in students' conceptual understanding ability before and after the treatment is given.

To determine the influence of students' mathematical concept understanding ability applied with the TGT learning model assisted by the Plickers application media, a hypothesis test was conducted from the research results. The data used were the pretest and posttest scores of students' mathematical concept understanding ability in the experimental and control classes.

1. Normality Test

The results of the normality test can be seen in table 4. Below:

Table 4. Data Normality Test

Class	Types of Tests	Sig Value	Real Level	Information
Experiment	*Pre-test*	0.074	0.05	H_0accepted
	Post-test	0.075	0.05	H_0accepted
Control	*Pre-test*	0.063	0.05	H_0accepted
	Post-test	0.077	0.05	H_0accepted

Based on Table 4, it was found that the pretest and posttest results in the experimental class and control class had significant values greater than the significance level () = 0.05, so they were accepted and rejected, so it can be concluded that the pretest-posttest data for the experimental class and also the control class were normally distributed.$\alpha H_0 H_0$

2. Homogeneity Test

The results of the homogeneity test can be seen in table 5. Below:

Table 5. Pretest Data Homogeneity Test

*SPPS Software*23		*Excel*		Caption
Sig Value	Real Level	F_{hitung}	F_{tabel}	
0.132	0.05	0.610	1,848	H_0accepted

Based on Table 5. with calculations using SPPS 23 Software, it can be seen that 0.132 > 0.05, which means sig. > significance level () and calculations using Microsoft Office Excel

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obtained a valueα0.610 < 1.848 which means$F_{hitung} \leq$, then it can be concludedF_{tabel} H_0accepted, meaning the pretest group data is the same (homogeneous).

Table 6. Posttest Data Homogeneity Test

*SPPS Software*23		*Excel*		Caption
Sig Value	Real Level	F_{hitung}	F_{tabel}	
0.086	0.05	1,572	1,848	H_0accepted

Based on Table 5. with calculations using SPPS 23 Software, it can be seen that 0.086 > 0.05, which means sig. > significance level () and calculations using Microsoft Office Excel obtained a valueα1.572 < 1.848 which means$F_{hitung} \leq$, then it can be concludedF_{tabel} H_0accepted, meaning the posttest group data is the same (homogeneous).

3. Hypothesis Testing

Hypothesis testing using Independent Sample t Test with the help of SPSS software, significance level = 0.05 and Microsoft Office Excel. The results can be seen in table 7 below:α

Table 6. Data Hypothesis Testing

SPPS		*Excel*		Caption
Sig	Real Level	T_{hitung}	T_{tabel}	
0,000	0.05	7,903	2.00	H_0Rejected

Based on Table 6, it appears that the value <significant level, namely 0.000 <0.05 and namely -2.00 <7.903> 2.00, is rejected and accepted, so it can be concluded that there is a significant influence of the Teams Games Tournament learning model assisted by the Plickers application media on the ability to understand mathematical concepts of class XI students of SMA Negeri 10 Kota Bengkulu.$Sig\ (2-tailed) - t_{tabel} < t_{hitung} > +t_{tabel}$$H_0$$H_1$

The next step is to find out how much improvement is achieved from using the TGT learning model assisted by the application.*Plicker*and direct learning models for the ability to understand mathematical concepts can use tests. The calculation of values in this study uses the help of$N-GainN-Gain$*Microsoft Office Excel*with the following results:

Table 7. Calculation of N-Gain Value

Class	Student	$N-Gain$	Category
Experiment	30	0.581	Currently
Control	32	0.248	Low

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Based on Table 7, the values obtained$N-Gain$experimental class of 0.581 with a moderate category and quite effective interpretation. This means that overall the class in the experimental class students experienced an increase in their ability to understand mathematical concepts from before to after being given learning with the Team Games Tournament (TGT) model assisted by the Plickers application media.

While the results of the control class are at 0.248 which is in the low category and the interpretation is not effective, it can be concluded that the increase in students' mathematical concept understanding ability in the control class is in the low category so that the direct learning model is not effective to be used to improve students' mathematical concept understanding ability. Thus, we can conclude that the class taught with the Teams Games Tournament (TGT) learning model assisted by the Plickers application media is more effective than the direct learning model to improve students' mathematical concept understanding.$N-Gain$

This TGT learning model divides students into various groups, consisting of four to five students. All group members are involved in completing tasks, and there are games and competitions carried out using the Plickers application media. Students are trained to communicate with each other, interact and work together. Learning activities like this can provide direct experience to students so that the knowledge they have gained lasts a long time(Ulfa, 2021:94). This is caused by the TGT learning steps assisted by Plickers media which influence students' mathematical concept understanding abilities.

The class presentation stage is when the teacher explains the material and the students listen and ask questions related to the material that is not understood. The students' enthusiasm is clearly visible when the teacher tries to remind them of the previous material. This situation shows the students' efforts to restate the concepts that they have understood in their own words. The next stage, namely teams, is a discussion activity by answering questions given by the teacher indirectly making students have to be able to use, utilize, and choose certain procedures or operations in solving problems.

At the games stage, students play games in groups.Each group works together to answer questions using Plickers cards.This game uses the help of the Plickers application media. The game makes learning fun, attracts attention and increases students' motivation to learn.(Lestari

et al., 2018:123). At this stage, students discuss in working on the questions so that indirectly it will increase their ability to understand mathematical concepts slowly.

The next stage is the tournament. In this activity, students answer questions individually to get points (scores) for their group..At this stage, students indirectly improve their ability to understand mathematical concepts by answering the questions given. The final stage is team recognition. Here, awards are given to the group with the highest score. Awards challenge students again to be able to understand the material and work on the questions or problems given at the next meeting. Supported by the opinionSyahroni (2021, p. 41)which states that giving awards has an impact on learning motivation and development as well as the emotional bond between teachers and students.

The results of this discussion can be seen that TGT learning assisted by Plickers application media in mathematics learning indicates good potential to improve students' understanding of mathematical concepts. The increase in the ability to understand mathematical concepts that obtain TGT learning assisted by Plickers is because the learning procedure emphasizes that students are more active in building their understanding. Through TGT learning, students are encouraged to work together optimally in their groups. Cooperation here means that each member must help each other.

In the implementation of learning, students with higher abilities help students with lower abilities in understanding the learning material, so that students with lower abilities do not withdraw during learning and their learning outcomes improve. This is in line with the results of research which states that TGT cooperative learning can increase students' activeness and ability to understand mathematical concepts.(Rahmi et al., 2021:139; Rohmah & Wahyudin:138; Rosidin, 2019)

Conclusion

Based on the hypothesis testing conducted, the calculation results obtained with a significant t value of 0.000 less than the significance level of 0.05 and supported by an N-Gain value of 0.581 with a fairly effective increase, it can be concluded that there is a significant influence of the use of the Teams Games Tournament (TGT) learning model assisted by the Plickers application media on the ability to understand mathematical concepts of class XI students of SMA Negeri 10 Kota Bengkulu.

References

Ariani, T., & Agustini, D. (2018). Student team achievement division (STAD) learning model and teams games tournament (TGT) learning model: Impact on physics learning outcomes. Science and Physics Education Journal (SPEJ), 1(2), 65–77. https://doi.org/10.31539/spej.v1i2.271

Lestari, KE, & Yudhanegara, MR (2015). Mathematics education research (Anna (ed.); First). PT Refika Aditama.

Nurhayati, N., & Marliani, N. (2019). Cooperative learning model of Teams Games Tournament type in improving mathematical reasoning ability. National Panel Discussion …, 0812(80), 405–410. http://www.proceeding.unindra.ac.id/index.php/DPNPMunindra/article/view/607

Rahmi, A., Nuraina, N., & Listiana, Y. (2021). The effect of the Teams Games Tournament learning model assisted by teaching aids on students' mathematical concept understanding abilities. Malikussaleh Journal of Mathematics Education, 1(2), 134. https://doi.org/10.29103/jpmm.v1i2.6499

Rohmah, EA, & Wahyudin. (2019). The influence of the cooperative learning model of the Teams Games Tournament (TGT) type assisted by online game media on understanding concepts and reasoning. Ejournal.Upi.Edu, 8(2), 126. https://ejournal.upi.edu/index.php/eduhumaniora/article/view/5135

Rosidin. (2019). The influence of the cooperative learning model of the Teams Games Tournament (TGT) type assisted by ludo media on the mathematical concept understanding ability of class VIII students of MTs N 1 Bandar Lampung. 124.

Solmaz, E., & Cetin, E. (2017). Ask response play learn: Students' views on gamification based interactive response systems. Journal of Educational and Instructional Studies in the World, 7(3), 28–40.

Suprihatiningrum, J. (2017). Learning strategies theory & application. Waves.

Yunita, D., Kusyadi, I., Eka Tassia, S., & Pamulang, U. (2021). The use of the Plickers application for formative assessment data at Assa'adah Islamic High School. Journal of Community Service), 5(1), 95–100. http://ejurnal.ikippgribojonegoro.ac.id/index.php/J-ABDIPAMAS