

THE INFLUENCE OF A COOPERATIVE LEARNING MODEL OF TEAM GAMES TOURNAMENT (TGT) TYPE ON MATHEMATIC CRITICAL THINKING ABILITY THROUGH A SCIENTIFIC APPROACH TO STATISTICAL MATERIALS

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Keyword

TGT type Cooperative Learning, Critical Thinking Ability, Statistics

Abstract

This research was conducted on class This study is quantitative research. The data obtained in this research is from the initial test (pretest) and final test (posttest) by taking samples from class X3 as the experimental class and X5 as the control class. The data analysis techniques used are normality test, homogeneity test and hypothesis test. In the decision making criteria for the Mann Whitney U-Test, it is said that if the value of Asymp.Sig. (2-tailed) < 0.05 then H_0 is rejected and H_a is accepted. In this study Asymp.Sig (2-tailed) was less than 0.05 (0.034 < 0.05). So H_0 is rejected and H_a is accepted. So it can be concluded that using the team games tournament type cooperative learning model can influence students' critical thinking abilities in statistical material.

INTRODUCTION

Human resources are the main key for a nation to continue to develop. Therefore, to make Indonesia's human resources quality, action is needed to improve this quality from an early age. One important aspect in order to improve the quality of human resources is education. Education is an investment in human resources, where increasing skills and abilities is believed to be a supporting factor in human efforts in living life. Education is one step to prepare the nation's sons and daughters so they can compete in the future era of globalization and digital (Lestari, 2019).

Improving the quality of education must start from the formal and non-formal education levels. Formal education is a structured and tiered educational path consisting of basic education, secondary education and higher education. Non-formal education is an educational path outside formal education that can be implemented in a structured and tiered manner. Improving the quality of education in an educational unit is an action taken by an educational unit to improve the results of educational implementation, so that it is in accordance with the direction of educational policy that has been established through increasing the effectiveness and efficiency of the educational processes and activities carried out. The important role of education can be a learning experience where a person learns about various aspects of life, understands different perspectives and tries to apply them in everyday life (Santoso, 2012). Education also has an important role in various fields to develop human resources and technology.

One field of science that has an important role in the development of human resources and technology is mathematics. Mathematics is an important subject, because this lesson is

very close to everyday life. Apart from that, by studying mathematics a person gets used to thinking systematically, scientifically, logically, critically, increasing their creativity. This agrees with Ahmad Susanto's view, that "mathematics is a science that can improve thinking and reasoning abilities, contributing to solving daily problems and in the world of work" (Safitri, 2020). There is a lot of material in mathematics subjects. One of the materials in mathematics is statistics.

Statistics is a science that was originally used to collect and present data in a way that is easier to understand and has informative properties (Rahmawati, 2020). The aim of learning statistics is so that students can understand how to obtain data, determine the type and size of data, check, round and arrange data to solve problems. The basic competencies that must be achieved include: (1) Reading data in the form of tables and bar, line, circle and ogive diagrams; (2) Presenting data in the form of tables and bar, line, circle and ogive diagrams and their interpretation, (3) Calculating the size of concentration, size of location and size of data distribution, as well as their interpretation. However, there are still many students who have difficulty determining the elements that are known and those that are being asked about, making examples, determining formulas, and making conclusions.

Based on the results of Rosiyanti's research (2022), students still have difficulty working on statistics questions. The difficulties faced by students are the difficulty of understanding and applying the mean, median, mode and difficulty in applying the mean, median and mode formulas to data presented in tabular form. The cause could be due to several factors, for example teachers who do not master the concepts so that the material presented is lacking, students' interest in learning mathematics is lacking, and another cause is a lack of educational resources for learning mathematics. The factors that influence student difficulties are part of the learning process.

Learning is a teaching and learning process created by teachers to grow and develop students' insight, creativity and mindset about science. Learning strategies have three important aspects, namely techniques, methods and approaches (Fahrul, 2023). Apart from that, learning also contains various interconnected components, namely teachers, students, methods, objectives, materials, learning media, and evaluation. Interactions between teachers and students must be carried out fairly. Teachers must provide opportunities for students to communicate and express their opinions. However, in reality, the learning carried out currently is mostly centered on educators, so that students are less active in learning activities in class, especially when learning mathematics. The quality of learning in Indonesia is still very low when compared to the quality of learning in other countries. The main causes are the low quality of teachers and student achievement as well as inadequate facilities and infrastructure. The lack of use of various learning models and the use of interesting media when learning mathematics in class also hinders students from creating a spirit of cooperation and responsibility when learning mathematics. Student participation, which is still low, is a problem that needs to be resolved to encourage students to be more active in learning activities in class.

To overcome the problem of low learning quality, it needs to be resolved so that the quality of learning can improve. One step that can be taken is to implement a creative and innovative learning model so that it can encourage students to be proactive. A learning model is a framework that provides a systematic description for implementing learning to help students learn in certain goals to be achieved (Fahrul, 2023). There are many learning models that are applied, including discovery learning models, problem based learning models, project based learning models, inquiry based learning models, and cooperative learning models. From the learning model currently implemented, the cooperative learning model can provide opportunities for students to express their opinions and students can learn in groups. Cooperative learning is a learning model where students learn and work collaboratively in

small groups consisting of 4 to 5 students with a heterogeneous group structure. The cooperative learning model provides opportunities for students to use questioning skills and discuss problems, allows students to more intensively conduct investigations regarding a case or problem, develops leadership talents and teaches discussion skills, and students participate more actively in discussions. In cooperative learning, there are various types of models that can be applied, including jigsaw, think pair share, STAD (student team achievement division), group investigation, make a match, listening team, and TGT (Team Games Tournament), (Safitri, 2020). One type of cooperative learning that is fun and can shorten teaching and learning activities is the Team Games Tournament (TGT) cooperative model.

Team Games Tournament (TGT) is a type of cooperative learning method that is easy to implement and involves the activities of all students without needing to differentiate their status, related to student abilities. The role is as a peer instructor and contains elements of play (Sandra, 2022). The TGT type cooperative learning model is a cooperative learning model that is easy to implement and involves all students without any differences. This type involves the role of students as peer instructors, contains game elements that can stimulate enthusiasm for learning. Learning activities are designed using the TGT type learning model to help students learn in a fun atmosphere, while still prioritizing a sense of responsibility, honesty, cooperation, healthy competition and student participation in learning.

Teachers in the learning process need to prioritize personal experience through the process of observing, asking questions, reasoning, and trying to increase students' creativity. Apart from that, it also familiarizes students with working in teams through cooperative learning. One approach that is considered relevant is the scientific approach, because the scientific approach learning stage is designed in such a way that students are active in learning, including actively constructing concepts, laws or principles through the process of observing, asking questions, gathering information, associating and communicating concepts, laws or principles. found (Ramadhana, 2016).

In the scientific approach, teachers no longer simply deliver material by lecturing, but instead the teacher acts as a facilitator and motivator, and invites students to be active in learning. Learning using the scientific method has the following characteristics Ramadhana (2016): (1) Centered on students. (2) Involves scientific process skills in constructing concepts, laws or principles. (3) Involves cognitive processes that have the potential to stimulate intellectual development, especially students' higher-order thinking skills. (4) Can develop students' character and ability to think critically mathematically.

Learning with a scientific approach also has a good influence on critical mathematical thinking skills (Indriani, 2020). Thinking skills improve students' understanding of concepts, reasoning, and critical and creative thinking skills. One of the thinking skills is mathematical critical thinking. Mathematical critical thinking ability is a process of processing information that involves knowledge, reasoning and mathematical proof so that it can solve a problem, especially in mathematics learning. Critical thinking in mathematics learning can minimize the occurrence of errors when solving problems, so that the final result will be a solution with the right conclusion. Every individual needs critical thinking skills to successfully solve problems in difficult situations. The difficulty of critical mathematical thinking skills is also experienced by students at Kedungpring Unity High School. From the results of the researcher's observations and interviews with one of the mathematics teachers at Kedungpring Union High School, it was found that students' mathematical critical thinking skills were still relatively low and students were less active in the learning process. Based on the description of the problem above, researchers are interested in examining the influence of the team games tournament (TGT) type cooperative learning model on mathematical critical thinking skills through a scientific approach to statistical material.

METHOD

This research uses quantitative research. Quantitative research is a method used to test certain theories by examining the relationships between variables. The research method used by researchers in this research is the experimental research method. Experimental research methods are research used to find the effect of certain treatments (Arifin, 2017).

The experimental design used in this research is a quasi experimental design. The purpose of choosing this design is to determine the effect of the team games tournament type cooperative learning model on students' mathematical critical thinking abilities through a scientific approach. The design form of this research is The Nonequivalent Pretest-Posttest Control Group Design, namely a design that provides a pretest before being given treatment, and a posttest after being given treatment in each class.

In this design, the researcher made observations in two classes, namely the class that was treated with the team games tournament type cooperative learning model or referred to as the experimental class and the class that was treated with the conventional learning model or referred to as the control class. Furthermore, in this design, before being given treatment, both classes are given a pretest with the same test, to determine the initial abilities of the two classes.

Then, the experimental class was given treatment, namely using a team games tournament type cooperative learning model. Meanwhile, the control class uses a conventional learning model. After each was given treatment, the researcher then gave a posttest to both classes, to measure students' mathematical critical thinking abilities after following the learning process, as well as comparing the results of the initial test and final test, whether there was an influence or not on students' mathematical critical thinking abilities.

RESULTS

Pretest and posttest data were taken to see the initial and final results of student learning as a whole with the aim of seeing initial and final abilities between the control class and the experimental class. The following are the pretest and posttest results of experimental class students:

Table 1. Frequency Distribution of Pretest and Posttest Results in Experimental and Control Classes

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	Pretest	Posttest	Pretest	Posttest
20 – 30	5	-	7	-
31 – 40	4	-	8	-
41 – 50	9	1	6	13
51 – 60	6	14	3	7
61 – 70	5	12	5	3
71 – 80	-	2	-	6

Based on the calculation results in table 4.11 above, it was found that the experimental class pretest had the highest score range for 9 students out of 29 students with a score range of 41-50. Meanwhile, the lowest value range was for 4 students out of 29 students with a range of values. In the experimental class posttest, it was found that the highest score range was 14 students out of 29 students with a score range of 51-60. Meanwhile, the lowest score range was 1 student out of 29 students with a score range of 41-50.

Meanwhile, the control class pretest had the highest score range for 8 students out of 29 students with a range of 31-40. Meanwhile, the lowest score range was for 3 students with a score range of 51-60. In the control class posttest, it was found that the highest score range was 13 students with a score range of 41-50. Meanwhile, the lowest score range was 3 students with a score range of 61-70.

In this research, hypothesis testing was carried out using the Mann Whitney U-Test. The following are the results of the Mann Whitney U-Test calculation of the posttest results for the experimental class and control class:

Table 2. Mann Whitney U-Test Hypothesis Test

Hasil Kemampuan Berpikir Kritis	Mann-whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
	285.000	720.000	-2.115	0.034

In the Mann Whitney U-Test decision making criteria it is said that if the Asymp. Sig. (2-tailed) < 0.05 then H_o is rejected and H_a is accepted. It can be seen in table 4.18 that the value of Asymp. Sig. (2-tailed) in this study was less than 0.05 (0.034 < 0.05). So H_o is rejected and H_a is accepted. So it can be concluded that using the team games tournament type cooperative learning model can have an effect on increasing students' critical thinking skills in statistical material.

DISCUSSION

The team games tournament type cooperative learning model can be applied to mathematics learning in class. In team games tournaments, students play games with other team members to get scores for their respective teams. The game is structured in the form of a quiz in the form of questions related to the subject matter written on cards attached to the blackboard.

At the first meeting, the researcher gave a pretest in the experimental class and control class with students working on five questions that had been prepared by the researcher. This was done to collect value data that shows students' initial abilities in mathematical critical thinking skills related to statistical material (quartile and interquartile range).

At the second meeting, the researcher conducted classroom learning regarding statistical material (quartile range) using a team games tournament type cooperative learning model in the experimental class and using a conventional learning model in the control class. When this learning model was applied, students responded less enthusiastically and also did not accept the application of the team games tournament type cooperative learning model. This is influenced by the habits of students who still receive the lecture learning model applied by the teacher. Students tend to be less active in the learning process.

At the third meeting, researchers conducted classroom learning regarding statistical material (interquartile range) using a team games tournament type cooperative learning model in the experimental class and using conventional models. When this learning model was implemented, students responded well and were enthusiastic about implementing a learning model that was different from what they usually received. As learning progresses, students slowly begin to adapt to the team games tournament type cooperative learning model and begin to actively follow several learning steps in a good and orderly manner. The steps in team games tournament type cooperative learning begin with student activities in solving initial problems given by researchers regarding the learning material to be studied, providing games in the middle of learning and ending with presenting and giving awards for the results of student discussions.

In the first stage of the team games tournament type cooperative learning model, the researcher explains the objectives, appreciation and motivation of students regarding the material to be discussed. At this stage, students are also given a problem related to statistical material (quartile and interquartile range). Researchers asked students to observe and also solve problems and then discuss them together. Providing a problem at the beginning of learning aims

to stimulate students to start learning and foster students' curiosity about the material to be studied (quartile and interquartile range).

The second stage is organizing students to study. At this stage students are divided into 6 groups consisting of 4-5 students. Researchers provide learning media to be discussed with each group. Next, the researcher asked each group member to work on the questions provided in turns for a duration of 3 minutes. Providing learning media aims to introduce students to learning in a fun way and students can be more active in the learning process. This is in line with the opinion of Novia (2023) that providing learning media for academic games is more interesting and stimulates student activity but still matches the characteristics.

The third stage is guiding the group to work and study. In this third stage, students are required to discuss the question with their group. The researcher instructed students to understand the results of their respective group discussions.

The fourth and final stage of team games tournament type cooperative learning is that the researcher and the students conclude and evaluate the problem solving in learning media and the results of the work done by the students and give awards to the group that has the highest score.

After being given treatment by applying the team games tournament type cooperative learning model for 2 meetings, students were then given a posttest to see the increase in students' mathematical critical thinking skills in the experimental class and control class. From the results of the posttest data analysis of critical thinking skills, it shows that 14 out of 29 students who were taught using the team games tournament type cooperative learning model got a higher score range, namely 51 -60, compared to the score range for students taught using the conventional learning model, namely 13 students out of 29. students got a score range of 41 – 50. This shows an improvement and is reinforced by the results of the u-test. The results of the u-test are Asymp. Sig. (2-tailed) less than 0.05 ($0.034 < 0.05$). So H_0 is rejected and H_a is accepted. So it can be concluded that using the team games tournament type cooperative learning model can have an effect on increasing students' critical thinking skills in statistical material.

Based on the description above, the team games tournament type cooperative learning model provides a positive influence on the development of students' critical thinking skills compared to using conventional learning. This is in line with the results of research conducted by Hanafi (2022) that the TGT learning model has a positive impact in improving students' critical thinking abilities.

CONCLUSION

Based on the research results, data analysis, and discussion in the previous chapter, it can be concluded as follows: (1) The critical thinking abilities of students in the experimental class using the team games tournament type cooperative learning model for 4 students out of 29 students had a score range of 51–60. This value range is higher when compared to the value range before the team games tournament type cooperative learning model was applied, namely 9 students out of 29 students with a range of 41 – 50. Meanwhile, the mathematical critical thinking skills of students in the control class used conventional learning models in 13 students out of 29 students have a score range of 41–50. 8 students out of 29 students had a score range of 31–40 before using the conventional learning model. (2) The team games tournament type cooperative learning model has an effect on increasing students' critical thinking abilities. This can be seen from the critical thinking abilities of students who are taught through learning using the team games tournament type cooperative learning model which is higher than students who are taught using conventional learning models.

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