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The Effect of Cooperative Learning Model Type Tgt Assisted by PPT Integrated Quizizz Paper Mode on Mastery of Physics Concepts in Senior High School

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Abstract

In learning physics, mastery of concepts is a basic element that must be mastered by students. This is because physics emphasizes understanding natural phenomena and abstract natural principles, so logical thinking is needed to understand this in depth. Without good concept mastery, students will experience obstacles to solving problems, understanding physical phenomena, and applying them in the context of everyday life. However, current learning has not been able to have a meaningful impact on students' concept mastery, especially in physics, which is considered an abstract subject. Therefore, innovations are needed related to learning models and media, one of which is the TGT type cooperative learning model assisted by PPT integrated Quizizz Paper Mode. The approach used in this research is quantitative. The method used is an experiment with a type of quasi-experimental design, namely a non-equivalent control group design. This research was conducted at SMAN Arjasa Jember in early 2025. Sample selection using nonprobability sampling type purposive sampling and obtained class XI-1 as the experimental class and class XI-2 as the control class. Before being given treatment, both classes were given a pretest to determine students' initial concept mastery. After the treatment, both classes were given a posttest and obtained a significance value smaller than 0.05, which showed a difference in concept mastery between the experimental and control classes. Thus, it can be concluded that the TGT type cooperative learning model assisted by PPT integrated Quizizz Paper Mode has a significant effect on the mastery of physics concepts in high school.

Keywords: *Cooperative Learning Model, TGT, concepts mastery, Quizizz Paper Mode*

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INTRODUCTION

21st-century education requires students to have a variety of skills and deep conceptual understanding in order to compete and adapt to the times (Mahsun et al., 2023; Ratama et al., 2021). In the context of science learning, especially physics, concept mastery is an important aspect that students must have. Physics is a science that emphasizes the understanding of natural phenomena and scientific principles that are often abstract and require logical and systematic understanding (Siswono, 2017). Without good mastery of concepts, students are likely to encounter difficulties in solving problems, understand physical phenomena, and apply concepts in everyday life.

However, in practice students' mastery of physics concepts is still relatively low. Research results Putra et al, (2020) show that many students have difficulty in understanding the basic concepts of physics. The same thing was also expressed by Alam et al, (2017), which states that the concepts in physics are considered abstract and difficult to understand by students. This is reinforced by the results of the researcher's interview with the physics teacher at SMAN Arjasa Jember, which shows that the students' daily test scores are still below the Minimum Completion Criteria, indicating a weak mastery of student concepts.

Various efforts have been made to improve students' mastery of concepts, one of which is by choosing a learning model that matches the characteristics of the subject and the needs of students at school. An effective learning model can help create an active, enjoyable learning atmosphere and encourage optimal student involvement (Salsabillah et al, 2018; Sariningrum et al, 2017). One model that can be used to improve concept mastery is the Team Games Tournament (TGT) cooperative learning model. This model combines group learning with game elements, which not only makes the learning atmosphere more interactive but also encourages students to understand the material more deeply through discussion and competition (Widayanti & Slameto, 2016). This model uses constructivist theory, where students actively seek learning resources and information through peers. Learning with peers has advantages. This is because students can learn without feeling uncomfortable, so that they can improve student understanding (Ariani & Agustini, 2018). As such, the application of the TGT type cooperative learning model is seen as a potential alternative learning strategy that is effective in improving students' concept mastery through social interaction, teamwork, and a learning atmosphere that supports students' active involvement.

To support the implementation of the TGT model, learning media is needed that can help explain the material visually and interestingly, such as PowerPoint presentation media (PPT). PPT makes it easier for teachers to present material with a more systematic and visual display, thus helping students understand complex concepts. In order for learning to be more interesting and varied, PPT can also be integrated with interactive digital media such as Quizizz. The Paper Mode feature offered by Quizizz provides a unique learning experience, which combines digital learning with paper-based assessments, thus maintaining traditional aspects in a modern and fun atmosphere (Husnah et al, 2023).

Several previous studies have shown that the use of the TGT model and Quizizz Paper Mode media has a positive influence on student performance, including in exact subjects (Aziz et al, 2021; Kania & Fitri, 2024; Siregar & Putri, 2022). However, studies that specifically analyze the outcome of the TGT type cooperative learning model assisted by PPT integrated with Quizizz Paper Mode on mastery of physics concepts in high school are still very limited. Therefore, further research is needed to determine the effectiveness of these models and media in improving students' mastery of physics concepts.

This study investigates the influence of the TGT-type cooperative learning model assisted by PPT integrated with Quizizz Paper Mode on mastery of physics concepts at the high school level as an effort to overcome the low understanding of student concepts.

RESEARCH METHOD

This research is quantitative research with the experimental method, which is quasi quasi-experimental design with a non-equivalent control group design. The research was conducted at SMAN Arjasa Jember in the even semester of the 2024/2025 academic year. This research design table can be seen in Figure 1.

O_1	X	O_2
O_3		O_4

Figure 1. Non-equivalent Control Group Research Design (Hamzah & Susanti, 2020)

The population of this study was all students of class XI MIPA. The sample selection used non-probability sampling of the purposive sampling type (Hamzah & Susanti, 2020). The use of sampling is due to the outcomes of the homogeneity test, which shows that the population is not homogeneous, so it cannot use random sampling. All classes are taken from odd semester physics score data, and then sample selection is based on the same average score or has the smallest difference. The acquisition of odd semester physics scores in the 2024/2025 school year can be observed in Table 1.

Table 1. Odd semester physics score of class XI SMAN Arjasa Jember school year 2024/2025

	Odd Semester Physics Score			
Class	**XI-1**	**X1-2**	**XI-3**	**XI-4**
Number of students	36	36	36	36
Average	88,05556	88,05556	86,58333	86,97222
Highest score	92	92	89	89
Lowest score	84	84	84	85

Based on Table 1, the researcher designated class XI-1 (experimental group) and class XI-2 (control group) as research subject, applying TGT type cooperative learning model assisted by Quizizz Paper Mode in the class XI-1 and traditional teaching in class XI-2, where each class amounted to 36 students.

The research instrument for data collection is a multiple-choice test with rational justification that use Bloom's Taxonomy cognitive domain. The selection of the instrument is based on students' ability to master concepts so that students are able to describe the reasons and explanations related to the multiple choices that have been selected. After the data is collected, the next technique is to analyze the concept mastery data consisting of the normality test stage, homogeneity test, and hypothesis testing using the Mann-Whitney U-Test with a significance level of 5%.

RESEARCH RESULTS AND DISCUSSION

The main objective in this research is to analyze the impact of the TGT type cooperative learning model assisted by PPT integrated with Quizizz Paper Mode on students' mastery of physics concepts. This research was conducted for 4

meetings. In the first meeting, both classes underwent a pretest to identify the initial ability of students to master physics concepts, especially wave material. In the second meeting, both classes were given material related to the types and properties of waves, the third meeting related to wave magnitudes, and the last meeting related to wave deviation. Then, for the posttest given at the end of each meeting, to indicate the mastery of student concepts after being given with reference to Bloom's Taxonomy aspects C1-C6. Before hypothesis testing using Mann-Whitney, prerequisite tests were carried out in the form of normality and homogeneity tests. The normality test in this study used the Shapiro-Wilk and Homogeneity tests using Levene's test. The concept mastery data obtained is then calculated on average and presented in Table 2.

Table 2. Statistical description of pretest scores and posttest scores of concept mastery of experimental and control classes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Experiment Class Pretest	35	14.7	67.6	37.814	13.7468
Control Class Pretest	36	13.2	79.4	32.339	13.9113
Experiment Class Posttest	35	33.8	95.6	61.174	18.1334
Control Class Posttest	36	16.2	89.7	50.728	12.5884
Valid N (listwise)	35				

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

As show in Table 2, the data reveals that the mean value of mastery of physics concepts in both classes has a difference. The mean value of the experimental class concept mastery pretest is 37.814 with a minimum value of 14.7 and a maximum value of 67.6, while for the control class concept mastery pretest value is 32.339 with a minimum value of 13.2 and a maximum value of 79.4. As for the average posttest value of mastery of the concept of the experimental class is 61.174 with a minimum value of 33.8 and a maximum value of 95.6, while for the posttest value of mastery of the concept of the control class is 50.728 with a minimum value of 16.2 and a maximum value of 89.7.

The pretest data, which became the initial concept mastery data, was analyzed to evaluate the prior knowledge of students in the experimental and control groups. The first analysis is the normality test. The results of the normality test for the pretest value of concept mastery for both classes are show in Table 3.

Table 3. Normality test results of pretest mastery of physics concepts of experimental and control classes

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Concept Mastery Pretest	Experiment Class	.138	35	.091	.957	35	.180
	Control Class	.168	36	.012	.878	36	.001

a. Lilliefors Significance Correction

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

Based on Table 3, the significance value for the experimental class is 0.180, where as for the control class it is 0.001. notably, the experimental class's

significance value is greater than 0.005, so that the data can be normally distributed, while for the control class it is smaller than 0.05, so that the distribution is not normal.

The next stage is the homogeneity test, with the purpose of identifiying the data distribution across the two groups. The results of the concept mastery pretest homogeneity test for both classes is shown in Table 4.

Table 4. Homogeneity test results of pretest mastery of physics concepts

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Concept Mastery Pretest	Based on the Mean	.648	1	69	.424
	Based on Median	.645	1	69	.425
	Based on Median and with adjusted df	.645	1	65.483	.425
	Based on the trimmed mean	.889	1	69	.349

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

According to Table 4, the significance value is 0.424, so that it is greater than 0.05, then the pretest data of the two classes are considered homogeneous. Based on these results, the distribution of data between the two groups is considered the same or relatively the same, so that researchers can provide treatment for both groups. The next stage is hypothesis testing using the Mann-Whitney U-Test alternative test, with the outcomes presented in Table 5.

Table 5. Concept mastery pretest test results using Mann-Whitney U-Test

Test Statistics

	Concept Mastery Pretest
Mann-Whitney U	468.500
Wilcoxon W	1134.500
Z	-1.860
Asymp. Sig. (2-tailed)	.063
a. Grouping Variable: Class	

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

According to Table 5, the significance value obtained is 0.063, exceeding 0.05, which leads to the acceptance of H_0 and rejection of H_a, indicating no significant difference in pretest score of concept mastery between the experimental and control classes.

After giving the pretest of concept mastery, both classes will be given treatment. After that, a post-test will be given to determine whether there is an indication of concept mastery from the treatment that has been given. The posttest data that has been obtained needs to be tested for normality, which is listed in Table 6.

Table 6. Normality test of concept mastery post-test

Tests of Normality

			Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Class	Statistic	df	Sig.	Statistic	df	Sig.
Concept Posttest	Mastery	Experiment Class	.160	35	.023	.906	35	.006
		Control Class	.163	36	.017	.918	36	.011

a. Lilliefors Significance Correction

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

According to Table 6, the significance is 0.006 for the experimental class and 0.011 for the control class. Both values are smaller than 0.05, so the experimental and control class data are not normally distributed. Based on these results, the Mann-Whitney U-test hypothesis test will be continued because the normality assumption is not met. The data of the post-test of mastery of physics concepts using the Mann-Whitney U-test is shown in Table 7.

Table 7. The data of the concept mastery post-test using the Mann-Whitney U-Test z

Test Statistics

	Concept mastery Posttest
Mann-Whitney U	427.000
Wilcoxon W	1093.000
Z	-2.337
Asymp. Sig. (2-tailed)	.019

a. Grouping Variable: Class

(source: The outcomes of data analysis performed with SPSS version 25.0 Windows)

Based on Table 7, it is obtained that the significance value is smaller than 0.05, so it can be concluded that there is a difference in concept mastery between the experimental class and the control class. Furthermore, the concept mastery posttest data is presented in the form of a graph, presented in Figure 2, to illustrate the average mastery of concepts for each cognitive domain in Bloom's Taxonomy, which includes C1, C2, C3, C4, C5, and C6.

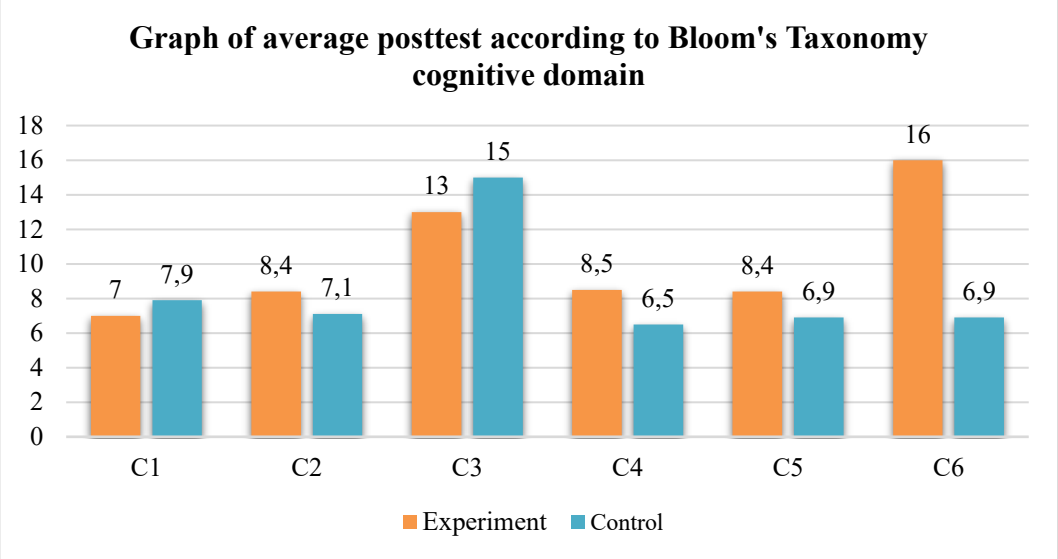

Figure 2. Graph of the average posttest of concept mastery according to Bloom's Taxonomy cognitive domain

The graph above shows the mean of the concept mastery post-test. According to the graph, the experimental class has a superior average level in the domains of understanding (C2), analyzing (C4), evaluating (C5), and creating (C6). As for the realm of remembering (C1) and applying (C3), the experimental class has a lower average level. This difference was influenced by the TGT type cooperative learning model integrated with Quizizz Paper Mode given to the experimental class. This explanation is supported by Aziz et al. (2021) who found that the TGT-type cooperative learning model affects students' mastery of mathematical concepts. In addition Kania & Fitri (2024) found that using the TGT type cooperative learning model along with Quizizz Paper Mode media can enhance students' understanding of mathematical concepts. Therefore, the findings of this researcher are relevant to the two previous studies.

The TGT type cooperative learning model is a model that prioritizes teamwork so that it can have a positive influence on concept mastery. Research conducted by Agustina et al (2020) found that this model allows students to interact and express opinions freely, increases self-confidence, increases students' ability to master the material, increases sensitivity, tolerance, cooperation, and increase sensitivity. These advantages certainly affect students' concept mastery.

The TGT cooperative learning model uses constructivist theory that allows students to actively seek knowledge through peers (Primandari et al., 2019). Students are asked to find solutions to the tasks given by discussing. Students build and seek their knowledge from the materials and information provided by the teacher. Students also actively seek additional information, both on the internet and in books. In addition, if the information obtained is not enough to complete the assigned task, students can discuss it with their group of friends.

During learning activities, both classes actively asked the teacher and completed the assigned tasks. However, in the experimental class, students were more active in discussing with their group friends, while in the control class,

students discussed with other groups and with their group friends. This is certainly influenced by one of the syntaxes in the TGT type cooperative learning model, namely games and tournaments that focus on group success, so that the experimental class has more discussions with their respective groups. The use of PPT media integrated with Quizizz Paper Mode strengthens the effectiveness of the TGT type cooperative learning model that visualizes physics material and tests students' mastery of concepts after grouping and discussing. The media assistance triggers students to master the concepts of the material that has been displayed. So that the application of the TGT type cooperative learning model assisted by PPT integrated with Quizizz Paper Mode has a significant effect on students' mastery of physics concepts in senior high school.

CONCLUSION

This study shows that the application of the TGT type cooperative learning model assisted by PPT integrated with Quizizz Paper Mode has a significant effect on the mastery of physics concepts in senior high school. This learning model increases students' understanding because it allows students to learn collaboratively with peers so that students are more free to ask questions, discuss, and express their opinions in small groups without any discomfort. The application of team, games, and tournament syntax has proven to be an effective combination to strengthen students' mastery of physics concepts. In addition, the use of PPT media integrated with Quizizz Paper Mode encourages an increase in the effectiveness of the TGT type cooperative learning model through strengthening the visualization of physics material and testing the results of students' mastery of concepts after grouping and discussion.

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