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The Differences Between the Application of the Think Pair Share (TPS) Cooperative Learning Model and the Conventional Model to Student Physics Learning Outcomes

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Abstract

This study aims to compare the application of the think pair share (TPS) learning method and conventional methods to student learning outcomes in physics learning. The type of research used is quasi-experimental (Quasy Experimental Design). The subjects in this study were two classes, namely 24 X MIPA 1 students as an experimental class using the Think Pair Share (TPS) learning method and 24 X MIPA 2 students as a control class using conventional methods. The sampling technique used purposive sampling. Data collection techniques using documentation, tests, and observations. The data analysis technique used in this study was the Independent Sample Test (t-test) with a significance level of 5%. Before the data were analyzed, a prerequisite test for normality analysis was carried out. The results showed differences in the learning outcomes of students taught using the TPS method with conventional methods in physics subjects. The average post-test score for the experimental class was 72.45, higher than the control class, which was 51.54. These results indicate that student learning outcomes in the experimental class experienced a significant increase compared to the control class. The results of calculating the gain score for the experimental class obtained an average pre-test of 54.04 and a post-test of 72.45, so a Gain of 0.40 was obtained in the moderate category. In the control class, the average pre-test was 49.87, and the post-test was 51.54, so a gain of 0.03 was obtained in the low category. Learning using the TPS method is better than conventional methods.

INTRODUCTION

The education process, which is organized based on a planned education system, is expected to balance the changes in society, nation, and state. Therefore attention to the learning process in schools must continue to be maximized. One of the efforts to improve the quality of education is through a good learning process to produce good student learning outcomes [1]

In general, many students are not interested in physics lessons. Because learning physics is difficult, and the basic principles and concepts are complex. The basic principles and concepts of physics can be learned by students independently. However, on the other hand, instructors teach with conventional methods, namely teacher-centered teaching. This teaching method is not able to improve students' physics learning. Therefore, students need to play an active role in learning physics by interacting with friends in the same class, discussing, and teaching each other the basic principles and concepts of physics.[2]. Theories in physics will be easy to follow if taught correctly [3].

Several factors identified as the cause of poor achievement and attitudes towards science, especially physics, among secondary school students are the teacher's teaching methods. Teachers prefer traditional lecture methods in teaching physics and are far from innovative teaching methods such as guided discovery, laboratory methods, computer-assisted instruction, Think-Pair-Share Instructional Strategies (TPS), and many others. What is important is that the selection of methods and content are appropriate to the content, enabling learners' active participation and encouraging retention and achievement in physics. The selection of the right method by the teacher teaching is expected to be more effective in achieving learning objectives [4]. Effective teaching strategies foster talent, communication skills, application abilities, understanding, problem-solving abilities, creative thinking, practical and productive skills, and students' confidence level to obtain meaningful learning [5]. This strategy effectively increases students' understanding and learning outcomes of physics [6,7,8].

Based on researchers' observations at one of the high schools in Wawonii, they still use a learning model where the teacher is the center of learning control. Conventional methods are not entirely unfavorable when applied to learning because each learning method has advantages and disadvantages. On the other hand, applying different methods, models, and approaches will certainly give students a new distinction in learning. Teachers who can provide a variety of learning methods will, in turn, make students more enthusiastic and happy during the learning process because they experience a different atmosphere [9].

An understanding related to teaching methods, problem-solving skills, practical work, and students' beliefs needs to be possessed by physics teachers. Necessary to increase student interest in learning[10]. Thus, it is important for physics teachers to understand interactive teaching methods [11] and student learning achievement [12]. Applying innovative teaching methods such as the Think-Pair-Share (TPS) model is one way to gain good physics knowledge and overcome weaknesses in the learning process. Think Pair Share is a type of cooperative learning designed to influence the interaction model of students with their group mates in providing answers to questions from the teacher. This interaction can increase motivation and provide thought stimulation to be useful in the long-term learning process [13,14]. Cooperative learning methods are more effective than conventional methods in teaching [15,16]. In addition, the TPS learning method influences student learning outcomes [17].

The Think Pair Shared (TPS) cooperative learning method is effective in being able to stimulate student activity and fun. Applying this learning model is expected to provide good learning for students. Determining the learning model used is one of the keys to determining the quality of the learning process. The fact is that teaching activities in schools are given theoretically and only focus on mastering the material. In addition, implementing teaching in the classroom also does not use an interesting learning model.

Learning outcomes are indicators to measure student knowledge and become a priority in evaluating learning outcomes [18]. Student learning outcomes are implemented using cooperative learning models of the think pair share type and conventional methods. Therefore, this study aims to make a comparison between the Application of the Think Pair Share (TPS) Cooperative Learning Model and the Conventional Method on Student Physics Learning Outcomes at SMA Negeri 1 Wawonii Tenggara and to ascertain how the Think-Pair-Share Strategy influences student outcomes student learning.

RESEARCH METHODS

The type of research used in this research is quasi-experimental design research. The research design used in this research was a pretest-posttest control group design. This study divided the tenth-grade science students at SMA Negeri 1 Wawonii Tenggara into two classes, namely the experimental class and the control class, each with 24 students. The experimental class was taught using the TPS learning model, and the control class was taught using the conventional model. Both classes were given a pre-test and post-test to measure student learning outcomes. Participants are not randomly selected because their learning class has already been formed and cannot be formed randomly. The goal is to maintain the authenticity of the classroom and learning environment [19].

After two classes were taken, class X MIPA 1 was assigned to be the experimental class, and class X MIPA 2 to be the control class. Observation, tests, documentation, and questionnaires collected data.

Table 1. Research Design

Class	Pre-test	Treatment	Post-test
Experiment	O_1	x_1	O_3
Control	O_2	x_2	O_4

The initial step for data analysis was to test the assumption of normality in the data with the Kolmogorov-Smirnov, Shapiro-Wilk, and Levene tests. Statistical analysis was performed using SPSS software (version 16). Test the increase in learning outcomes with a gain score. Table 2 is the categorization of learning outcomes based on the gain score.

Table 2. Categories of learning outcomes

No	Gain Score	Category
1.	$g \geq 0.7$	High
2.	$0,3 \leq g < 0,7$	Medium
3.	$g < 0,3$	Low

RESULTS AND DISCUSSION

In this study, the data presented are the results of learning physics before applying the think-pair-share learning model and the conventional method and the learning achievement data after applying the think-pair-share learning model and the conventional method. Learning outcomes are measured by applying the pre-test and post-test. Descriptive statistical data from measurements before and after applying the think-pair-share model and the conventional method are presented in Table 3.

Table 3. Student learning outcomes before (pre-test) and after treatment (post-test)

Statistic	Experiment Class		Control Class	
	Pre-test	Post-test	Pre-test	Post-test
Lowest score	32	55	30	40
Highest score	73	90	70	70
Mean	54.04	72.45	49.87	51.54
Median	55.28	73	50.72	50.5
Modus	51	75	50	55
Variance	104.6	77.79	77.44	38.49
Standard deviation	10.01	7.46	8.35	65.34

Based on Table 3, it can be seen that the average pre-test score for the experimental class was 54.04, which was 49.87 for the control class. These results indicate that the difference in student learning outcomes is not significant, and the average score tends to be in the less category. Meanwhile, the average post-test score for the experimental class was 72.45, which was higher than the control class, which was 51.54. These results indicate that student learning outcomes in the experimental class experienced a significant increase compared to the control class. In addition, the average score in the post-test for physics learning outcomes after applying TPS increased in the good category, while the application of the conventional method was in the less category, even though the value had increased. Indicates that teaching using the TPS method is more effective than conventional methods.

The importance of the TPS model in improving physics learning outcomes, it is necessary to carry out inferential testing using the t-test. Before carrying out the t-test, the data normality test was first performed. The normality test in this study used the Chi-square test with a significance level of 5% and SPSS-16 program assistance. Table 4 shows the normality test results of student learning outcomes before and after using the TPS model.

Table 4. Results of Normality Test of Student Learning Outcomes with Chi-square

Experiment Class	Mean	χ^2_{Count}	χ^2_{Table}	Distribution
Before Treatment	52.06	6.099	11.070	Normal
After Treatment	71.36	2.401	11.070	Normal

Table 4 shows the normality test of student learning outcomes before using the TPS learning model obtained. χ^2_{Count} $(6.099) < \chi^2_{Table}$ (11.070). Whereas after using the TPS learning model obtained χ^2_{Count} $(2.401) < \chi^2_{Table}$ (11.070). These results indicate that the normality test is normally distributed. Table 5 shows the normality test results of student learning outcomes before and after using the TPS model with SPSS-16.

Table 5. Normality Test Results for Student Learning Outcomes with SPSS-16

	Kolmogorov-smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Before Treatment	.102	24	.200	.964	24	.520
After Treatment	.210	24	.007	.927	24	.084

Based on Table 5, the normality test results of student learning outcomes before and after using the TPS model each obtained a significance value of 0.520 and 0.084, greater than 0.05 (the significance level used). These results indicate that the learning outcomes of students taught with the TPS-type cooperative learning model are normally distributed. In comparison, the normality test of student learning outcomes before and after using the conventional method is shown in Table 6.

Table 6. Results of Normality Test of Student Learning Outcomes with Chi-square

Conventional Class	Mean	χ^2_{Count}	χ^2_{Table}	Distribute
Before Treatment	50.16	2.752	11.070	Normal
After Treatment	60.8	1.731	11.070	Normal

Table 6 shows that the normality test of student learning outcomes before using conventional methods was obtained. $\chi^2_{Count} = 2.752$. This value is smaller than the Chi-Square critical value table, namely $\chi^2_{Table} = 11.070$ $(\chi^2_{Count} < \chi^2_{Table})$. While the normality test of student learning outcomes after using the TPS learning model obtained $\chi^2_{Count} = 1.731$. This value is smaller than the Chi-Square critical value table, namely $\chi^2_{Table} = 11.070$ $(\chi^2_{Count} < \chi^2_{Table})$. These results indicate that the normality test is normally distributed. Table 7 shows the normality test results of student learning outcomes before and after using conventional methods with SPSS-16.

Table 7. Results of Normality Test of Student Learning Outcomes with SPSS-16

	Kolmogorov-smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Before Treatment	.135	24	.200	.980	24	.898
After Treatment	.154	24	.148	.943	24	.192

Based on Table 7, the results of the processing of the normality test for student learning outcomes before and after using the conventional method each obtained a significance value of 0.898 and 0.192, both of which were greater than 0.05. These results indicate that the learning outcomes of students taught by conventional methods are normally distributed.

Calculation analysis on the independent t-test before applying the TPS and conventional methods is carried out using the average value before learning (pre-test). The statistical hypothesis of this study shows that H0 means no difference in students' physics learning outcomes before using the TPS model and conventional methods, and H1 means there is a difference in students' physics learning outcomes before using the TPS model and conventional methods. Inferential statistical analysis (t-test) is needed to test the research hypothesis. Table 8 tests the hypothesis of students' physics learning outcomes before using the TPS model and conventional methods with the t-test.

Table 8. Results of the Independent t-Test analysis between the Think Pair Share and Conventional Methods

Statistic		**Learning Outcomes before using the TPS Model and Conventional Methods**	
		Equal Variances Assumed	**Equal Variances not Assumed**
Levene's Test For Equality of Variances	F	.036	
	Sig.	.851	
t-test for Equality of Means	t	1.785	1.785
	df	46	45.759
	Sig.(2-tailed)	.081	.081
	Mean Difference	4.25000	4.25000
	Std. Error Difference	2.38082	238082
	95%Confidence Interval of the Difference Lower	- 54235	- 54303
	Upper	9.04235	9.04303

Based on Table 8, the results of the hypothesis test with SPSS-16 with a significant level of 5% and dk = 24 + 24 – 2 = 46 obtained t_{Count} (0.360) $< t_{Table}$ (2.00488) or $0.081 > 0.05$. These results indicate that H0 is accepted and H1 is rejected., which indicates no difference between using the TPS method and conventional methods on students' cognitive physics learning outcomes. That means students' initial ability before treatment is the same. Therefore it shows that there is no significant difference in the total pre-test scores of the two classes. These results clearly strengthen the descriptive analysis, which states that the results of students' physics learning before applying TPS and conventional methods tend to be the same.

Test the hypothesis of students' physics learning outcomes after using the TPS type cooperative learning model, and the conventional method used is paired sample t-test and independent t-test (independent sample t-test). Calculation analysis on paired sample t-test and independent t-test using the average value after carrying out learning (posttest). The statistical hypothesis of this study shows that H0 means no difference in students' physics learning outcomes after using the TPS model and conventional methods, and H1 means that there is a difference in students' physics learning outcomes after using the TPS model and conventional methods. Inferential statistical analysis (t-test) is needed to test the research hypothesis. Table 9 tests the hypothesis of students' physics learning outcomes after using the TPS model and conventional methods with the t-test.

Table 9. Hypothesis Testing of Students' Physics Learning Outcomes after Using the TPS Model and Conventional Methods with the T-test

Class	t_{Count}	t_{Table}	**Evidence**
Experiment	3.49667	2,00488	H_1accepted
Control			H_0 rejected

Based on Table 9, the results of the t-test with a significant level of 5% and dk = 24 + 24 – 2 = 46 obtained t_{count} (3.49667) $>t_{table}$ (2.00488). These results indicate differences in students' physics learning outcomes before using the TPS model, and the conventional method or H1 is accepted, and H0 is rejected. Hypothesis testing of student learning outcomes before using the TPS model and conventional methods was also done using SPSS-16, as in Table 10.

Table 10. Results of the Independent t-Test analysis between the Think Pair Share and Conventional Methods

Statistic		Learning Outcomes after using the TPS Model and Conventional Method		
		Equal Variances Assumed		Equal Variances not Assumed
Levene's Test For Equality of Variances	F	. 000		
	Sig.	1.000		
t-test for Equality of Means	T	9.500		9.500
	df	46		45.852
	Sig.(2-tailed)	.000		.000
	Mean Difference	20.91667		20.91667
	Std. Error Difference	2.20174		2.20174
	95%Confidence Interval of the Difference	Lower	16.48479	16.48440
		Upper	25.34855	25.34893

Based on Table 10, the results of the hypothesis test with a significant level of 5% and dk = 24 + 24 – 2 = 46 obtained t_{Count} $(9.500) > t_{Table}$ (2.00488) or $0.000 < 0.05$. These results indicate that H0 is rejected and H1 is accepted, which indicates a difference between the use of the TPS method and conventional methods on students' cognitive physics learning outcomes. That means there is an increase in student learning outcomes after being given treatment. These results also indicate a significant difference in the effect of TPS and conventional methods on physics learning outcomes. Sadiawan et al. reported the same results [20].

The significance of the effect of the TPS method on physics learning outcomes was also reported by Sembiring and Zagoto [21]. Posttest score analysis showed differences in students' understanding levels in the two classes taught by TPS and conventional methods. Students who are taught using the TPS model are proven to have better learning outcomes and collaborative abilities than those taught with the conventional model [22]. The t value obtained is significant for $p = 0.000 < 0.05$. Therefore this shows a significant difference in the post-test scores of students in the control and experimental classes. The average of the experimental class was higher than the control class, which indicated that the treatment significantly improved the learning outcomes of the experimental class. Therefore, the TPS-type cooperative method is effective in improving student learning outcomes.

Test the hypothesis of students' physics learning outcomes before and after using the TPS method with the statistical hypothesis showing that H0 means that there is no difference in students' physics learning outcomes before and after using the TPS model, and H1 means there are differences in students' physics learning outcomes before and after using the TPS model. Table 11 tests the hypothesis of students' physics learning outcomes before and after using the TPS model with the t-test.

Table 11. Hypothesis Testing of Students' Physics Learning Outcomes Before and After Using the TPS Model with a paired sample t-test

Class	t_{Count}	t_{Table}	Evidence
Pre-test	8,1641	2,0452	H_1accepted
Post-test			H_0 rejected

Based on Table 11, the results of the t-test with a significant level of 5% and dk = 24 – 1 = 23 obtained $t_{count}\ (8.1641)\ > t_{table}\ (2.00452)$. These results indicate differences in students' physics learning outcomes before and after using the TPS model, or H1 is accepted, and H0 is rejected. These results confirm that the TPS-type cooperative teaching strategy is more effective than others. There was a big difference in students' academic achievement and understanding of concepts on the pre-test and post-test. The TPS teaching strategy improves students' academic achievement, conceptual understanding, learning, motivation, reading, and writing skills and develops communication skills to solve class problems [23]. Testing the hypothesis of student learning outcomes before and after being taught with the TPS model using SPSS-16, as shown in Table 12.

Table 12. Hypothesis Testing of Students' Physics Learning Outcomes Before and After Using the TPS Model with the SPSS-16 Test

Statistic		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std Deviation	Std Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Before - After	6.17501	11.764553	1.69806	58.33394	65.16606	36.365	47	.000

Table 12 shows the t-test results with a significant level of 5% and df = 47 obtained. $t_{count}\ (36.365)\ > t_{table}\ (2.00452)$ or $0.000 < 0.05$. These results indicate differences in students' physics learning outcomes before and after using the TPS model, or H1 is accepted, and H0 is rejected. Thus, there is an effect of applying the TPS method on student physics learning outcomes [24]. The results of the gain score test can be seen in Table 13.

Table 13. Gain Score Test Results

	Experiment	Control
S_{pre}	54.04	49.87
S_{post}	72.45	51.54
N-Gain (g)	0.40	0.03
Evidence	Medium	Low

Based on Table 13, the increase in physics learning outcomes in the Experiment Class using the TPS method is higher than in the control class using conventional methods. The gain score calculation results for the experimental class were 0.40 (medium category) and 0.03 (low category) for the control class. The results showed that the TPS-type cooperative learning model was more effective than conventional methods in improving students' cognitive learning outcomes in physics subjects. The same results were reported by Novita et al. [24], which stated that the gain-score test for classes using the TPS cooperative method was in the medium category, and conventional methods were in a low category. The learning process is more effective with more discussion and increased student learning outcomes [25]. In other words, the increase in learning outcomes using the TPS method is higher than the conventional method. The two methods used tend to improve student learning outcomes, although there are differences in the results of the gain score, which is 0.37.

The results obtained in this study align with research conducted by [26], which states that there is an increase in students' physics learning activities and outcomes after applying Think Pair Share (TPS) Cooperative learning model. However, based on learning outcomes data, the TPS cooperative method is more effective in improving physics learning outcomes than conventional methods. The ineffectiveness of conventional methods in teaching physics has been reported [27] reporting the ineffectiveness of conventional teaching. In general, [28] also reported that cooperative learning affects student performance, namely achievement test scores significantly higher than in traditional classes. Educators must develop a curriculum by incorporating active teaching strategies such as the TPS-type cooperative method to improve student learning outcomes. Many researchers recommend implementing the TPS-type cooperative method in teaching in the classroom, including [23]; [29]; [5]; dan [30].

CONCLUSIONS

In this study, it was found that there were significant differences in physics learning outcomes between students who were taught with the TPS cooperative method and the conventional method. The TPS method is proven to impact students' physics learning outcomes significantly. Therefore, students taught using the TPS cooperative method have better learning outcomes than those taught using conventional methods. From the results of this study, it is hoped that the TPS-type cooperative learning method can be used in teaching in the classroom on physics subjects and can be used as an alternative learning model to improve physics learning outcomes.

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