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The Effect of Think Pair Share (TPS) Cooperative Learning to Improve Independent Learning, and Mathematics Learning Outcomes

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Abstract. This research aimed to determine the effect of the cooperative learning type Think Pair Share to increase learning independence and learning outcomes in mathematics. A quasi-experimental design with the nonequivalent control group is the type of research chosen. All mathematics students in semester 3 of FKIP UIR for the 2017/2018 academic year which consists of five classes, namely grade 3A – 3E are the population of this study. The purposive random sampling technique is the chosen technique. Furthermore, 2 classes were selected as samples, namely class 3E as the control class while class 3A as the experimental class. Data collection techniques used are non-test and test. The data were analyzed using a t-test. After the posttest data were analyzed, the average value of the experimental class and the control class were 83.97 and 85.76, respectively. The results of the inferential statistical analysis of posttest values obtained that t count > t table so that it rejects H_0. These means be found an effect of the TPS on increasing independence and mathematics learning outcomes for third-semester students of FKIP UIR.

INTRODUCTION

Students can actively develop the potential to have the necessary skills themselves in the learning process, thus benefiting themselves and others [1], [2]. The potential can be seen from a way of thinking that is critical, systematic, logical, creative, and willing to cooperate. This can be achieved through learning mathematics. By studying mathematics, students are trained to think critically, logically, systematically, and familiarize students to be resilient and meticulous in solving problems [3], [4]. In addition, mathematics has a strong and clear structure and interrelationships between its concepts that allow someone who studies it to be skilled at rational thinking [5].

Mathematics as one of the basic sciences has an important role in various areas of life, for example, can be seen from the many mathematical concepts that can be used both in the development of science and technology and in the life of everyday people [6]–[8]. However, there are still many students who find it difficult to learn mathematics. Difficulty in learning mathematics is considered a common thing, considering the object of mathematical studies in the form of facts, concepts, and principles that are abstract is difficult to understand [9]. In addition, mathematical concepts that are difficult to remember and do not understand cause low learning outcomes [10]. So we need a strategy, model, or tool so that learning difficulties in mathematics can be minimized [11].

Learning mathematics is the process by which mathematics is invented and constructed by humans, so math learning must be more built by students themselves than instilled by teachers [12]. Therefore, students are required to be independent and skilled in solving problems in everyday life, especially in math learning [13].

Learning independence is the ability of students in realizing their will or desires for real without relying on others, in other words, students can learn on their own, can determine effective learning, and can do learning activities independently [14]. Self-regulated learning is very influential for the learning process of students where students who lack learning independence tend to be passive which will ultimately affect learning motivation and student achievement [15], [16].

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Based on data on the results of the 3rd-semester student quiz study program FKIP UIR in the 2016/2017 school year, it is known that the value of mathematics quizzes in linear algebra courses is still relatively low. The data can be viewed in table 1:

TABLE 1. Linear Algebra Quiz Score for 3rd-semester Academic Year 2016/2017.

.Number	Average Value	Class
1	57.32	A
2	54.60	B
3	63.12	C
4	60.40	D

The reason for the low grades of these students. Students tend not to be active in learning the subject matter presented by lecturers, only a few students dare to appear in front of the class to solve the problem at the exercise. It is suspected that the ability of individual students in solving problems is still low, student learning independence is also still very lacking so that improvements need to be made in the learning process in the classroom. Other information obtained is the learning strategies used by lecturers in the teaching and learning process in the classroom are less varied, so students experience saturation that results in a lack of enthusiasm in learning.

One effective learning strategy that can be used in learning is the cooperative learning type Think Pair Share or abbreviated as TPS. Think Pair Share (TPS) is a type of cooperative learning designed to influence student interaction patterns. According to [17], Think Pair Share (TPS) gives more time to think, work independently, answer and help each other to optimize participation in learning. In addition, Think Pair Share (TPS) can also improve self-confidence and all students are give allowed to participate in classes [18]. There are three stages in this TPS learning model, namely the thinking stage, thinking stage, and the share (share) stage. By implementing the three stages of the Think Pair Share learning model can directly focus and improve student learning outcomes because it allowed students to be actively involved so that students can demonstrate and improve their learning independently.

METHODS

This research is quantitative research with quasi-experiment research design with the Non-equivalent control group. This reserach has two variables, namely cooperative learning type TPS and conventional learning as the independent variable (X) and student learning outcomes and independence as the dependent variable (Y). It's shown in table 2 below:

TABLE 2. Research Design with the Non-equivalent Control Group

Class	Pretest	Treatment	Experiment
Experiment	$O1_E$	X	$O2_E$
Control	$O3_K$	-	$O4_K$

Source: Modification [19]

Note : O1E : The results of the experimental class pretest
O3K : Control class pretest results
X : TPS type cooperative learning
- : Conventional Learning
O2E : Experimental class posttest results
O4K : Control class posttest results

All mathematics students semester 3 (three) FKIP UIR School Year 2017/2018 as a population. There are five classes, namely classes A through E. The sampling technique used is the purposive random sampling technique. Linear Algebra courses are powerful by three lecturers, where classes A and E are mastered by the researchers themselves. So the researcher decided to choose classes A and E as a sample of research with the consideration of the class will be more controlled because it is mastered by the researchers themselves. Furthermore, of the two classes, it was randomly determined which classes would be given treatment using conventional learning and TPS. Based on these determinations, class A gets treated by using cooperative learning type TPS and class E gets treatment by using conventional learning. The learning tools in this study are Lesson Plan, Student Worksheet (MFI), and problem sheet. Instruments for data collection in the form of non-tests and tests. Non-test instruments

used are students' self-regulated learning questionnaires while the tests used are modified essay forms. The research data analyzed are pretest and posttest data on aspects of learning outcomes and student self-regulated. Data processing is done using the t-test after all the assumptions of the test prerequisites are met.

RESULTS AND DISCUSSION

From the pretest and posttest data that have been carried out in both classes, it can be analyzed descriptively the value of student learning independence as can be seen in the following table:

TABLE 3. Pretest and Posttest Result Data for Experiment and Control Class

Descriptive Analysis	*Pretest*		*Posttest*	
	Experiment (3A)	**Control (3E)**	**Experiment (3A)**	**Control (3E)**
The Number of Samples (n)	33	33	33	33
Average ($\bar{x}$)	78,94	78,79	85,76	83,97
Standard Deviation	8,28	5,91	7,47	6,61
Variance	68,56	34,92	55,75	43,65
Maximum Value	95	92	97	101
Minimum Value	62	63	71	73

Based on the table above, it can be seen that on average the pretest results of the experimental class are not much different from the control class. But after being given treatment to the experimental class the average posttest result was much different from the control class. This explains that in experimental classes treated with the TPS learning model there was a better chance in value compared to the control class using conventional learning models. Then to see the or absence of the influence of TPS learning models on the learning outcomes of experimental classes and control classes, inferential analysis was carried out.

Pretest grades are obtained from the evaluation of students' learning before being given treatment with the material tested, Linear Combination, Base, and Dimension. Students are given 3 points of questions in the form of descriptions. Before hypothesis testing, the classic pre-requisite test of data analysis is a test of normality and homogeneity. In this study from both classes that were sampled had a total of 33 students each, so researchers stated that the sample data taken was under normal circumstances. Supported by the opinion of [20] which states that "Normality tests are not required against data of the same number or more than 30 pieces or called large samples". Next, test homogeneity to find out whether the experimental class and control class have the same variance or not before getting a different treatment.

TABLE 4. Homogeneity Test of Experimental and Control Class Pretest Values

Levene Statistic	df1	df2	Sig.	Conclusion
0,249	3	28	0,861	Homogenous

After all, the prerequisite tests for data analysis were met, then a two-mean difference test (T-test) was carried out to determine the comparison of prior knowledge before being given different treatment between the experimental class and the control class. The results of the T-test calculations can be seen in the following table:

TABLE 5. Test the Average Differences in Mathematics Learning Outcomes

	Team	F	T	df	Sig.
Learning outcomes	Equal Variances Assumed	83,154	5,910	65	0,072

The table above explains that, found a significance of 0.072 > 0.05. So, it was concluded that there was no difference in the average mathematics learning outcomes of the experimental and control class students. Afterwards, the posttest data obtained from student learning outcomes were tested after being given treatment. The results of the homogeneity test of posttest value of the experimental class and control class can be refer in the following table:

TABLE 6. Test of Homogeneity posttest Values for Experimental and Control Classes

Levene Statistic	Df_1	Df_2	Sig.	Conclusion
0,080	1	30	0,779	Homogenous

Because the data for two classes are homogeneous, then the average difference test (independent sample t-test) is then carried out to determine the comparison of prior knowledge before being given different treatment between the experimental class and the control class. The results of the calculation of the average similarity test can be seen in the following table:

TABLE 7. Posttest Group Statistics Average Similarity Test

	Team	N	Mean	Std. Deviation	Std. Error Mean
Outcomes	1	33	94,09	13,719	2,388
	2	34	74,29	11,839	2,030

Furthermore, it was found that the comparison of significance was 0.000 < 0.05, so it can be concluded that there is a difference in the average mathematics learning outcomes of students in the experimental class and the control class.

TABLE 8. Independent Sample T-test

	Team	F	T	Df	Sig.
Learning Outcomes	Equal Variances Assumed	0,61	0,805	6,330	0,000

Descriptive analysis and inferential analysis are analysis used in this research. Before the two classes were given treatment, a pretest was conducted. Then proceed with the homogeneity test and the data is not homogeneous and continue with the t-test. From the analysis of posttest data obtained, it can be seen that the average of the experimental class is 83.97 and the control class is 85.76. Based on the results of inferential statistical analysis of posttest values, it was obtained that t_count > t_table so that H_0 was rejected. This means that there is an effect of the TPS learning model on the mathematics learning outcomes of 3rd-semester students of FKIP UIR. The average score of the pretest and posttest scores for the experimental and control class can be refer in the following table:

TABLE 9. Pretest and Posttest Result Data for the Experiment and Control Class

Descriptive Analysis	*Pretest*		*Posttest*	
	Experiment (3A)	Control (3E)	Experiment (3A)	Control (3E)
The Number of Samples (n)	33	33	33	33
Average ($\bar{x}$)	78,94	78,79	85,76	83,97

From the table above, it can be seen that the pretest scores in the experimental class and the pretest scores in the control class have the same ability based on the different tests between the two average pretest scores. After being given treatment, the average post-test learning outcomes of the experimental class were better than the average learning outcomes of the control class. It means that the use of the TPS learning model has a better effect than the conventional learning model.

Along with this, it can be seen from the results of the experience gained by researchers during the application of the TPS model learning in the experimental class, the effect of student learning activities in the class is very visible. Although at first the students did not look active and were still confused in working on the questions on the student activity sheets distributed by each group member. However, at subsequent meetings, they have shown participation in discussions with their groups and have begun to understand the use of the TPS model in the Student Worksheet (MFI).

The TPS learning model can improve students' ability to remember information and a student can also learn from other students and convey their ideas to each other to be discussed before being presented in front of the class. Indirectly students' ability to communicate verbally can be seen. This is similar to the results of the study [21]–[23]. In addition, TPS can also improve self-confidence and all students are allowed to participate in class. The results of

this study support the study [24], [25]. Then at the end of the discussion, the teacher asked the group that had finished working on the Student Worksheet (MFI), to present the results of the discussion to the front of the class.

Meanwhile, in the control class, the researcher applied the conventional learning model, where the role of the lecturer was more dominant than that of the students. Students pay attention to the explanation given by the lecturer and students take notes. Sometimes when the lecturer explains in front of the class, students tend not to pay attention and make noise, but some students are active when the lecturer gives practice questions or individual assignments and does it, others only listen to the answers given by their friends. This will have an impact on the lack of mathematics learning outcomes that are seen in the final results (Posttest).

In another study, the application of cooperative learning strategies using the TPS method was successful in improving other abilities besides independence. As done by [26], [27], learning by applying the TPS method can improve speaking skills and communication skills. Furthermore, in research [28], [29] combining TPS method with ICT such as flipped classroom so that it can improve. Then, the TPS method can improve students' critical thinking [30]. In addition, the application of the TPS method combined with other strategies such as Problem has problem-solving and communication can improve [31]. Learning outcomes and students' critical thinking skills can be improved through the application of the TPS-based problem posing method [32], [33]. So it is hoped that future researchers will be able to develop the TPS method in such a way that it can be applied in distance learning (online) as it is today. For example, the TPS method is integrated with ICT. Because the current development of ICT can no longer be avoided [34]–[36].

From the results of data analysis on learning outcomes and self-reliance questionnaires, the research hypothesis can be accepted. This can be interpreted there is a significant influence effect of the TPS learning model on the mathematics learning outcomes of 3A semester students of FKIP UIR.

CONCLUSION

From the research result and discussion that has been put forward, this study concludes that Cooperative Learning with the TPS method can affect Independent and Mathematics Learning Outcomes of students of the Mathematics Study Program FKIP UIR, significantly on the material combination of linear, base and dimensions.

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