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Application of Cooperative Learning Models of Think Pair Shere Type to Improve Student Mathematics Learning Outcomes

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A B S T R A C T

The low mathematics learning outcomes can be an indicator of student difficulty in learning mathematics. This study aims to analyze the influence of the application of the cooperative learning model Think Pair Share (TPS) type to the results of mathematics learning. This research used quasi-experimental research with sampling using stratified techniques and random sampling. The population was seventh grade students at SMP 17 Pekanbaru, SMP 12 Pekanbaru, dan SMP 36 Pekanbaru. The instrument of this research was a daily test on the quadrilateral and triangle material to see student learning outcomes before being given treatment and after being given treatment. Statistical analysis was performed by Normality, Homogeneity Test, Independent Sample t-test, One Path Anova test, Two Path Anova Test. From the results of the collation test results obtained that p = 0.4425 and p = 0.4005, Ho is accepted, so there is no difference between the experimental class and the control class as well as the high school there is no difference, but the students' mathematics learning outcomes are reviewed from the level there are differences in the middle and lower schools. Generally, TPS learning is good at medium and low schools because in the learning process students still want to share knowledge with other students.

1. Introduction

Entering the 21st century, the national education system faces a very complex challenge in preparing the quality of human resources (HR) that are able to compete in the global era. This is because one of the efforts to prepare high

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quality and high quality human resources is through education. In connection with that, education must be well developed so as to be able to support potential student developers, so they are able to face and solve life's problems that continue to develop. Therefore, it is necessary to provide students with a number of scientific disciplines.

Mathematics is a science that plays an important role in the development of science and technology. Along with this role, mathematics is related to various other sciences. Through learning mathematics, students begin to be prepared to have the ability to think logically, critically, analytically, systematically and the ability to work together in a group. In NCTM (2000) it is stated that mathematics has five basic abilities which are the standard of mathematical ability namely problem solving, reasoning and proof, communication, connection, and representation. Based on the standard of ability, mathematics learning is not only required to convey material and receive material, but must have the ability and skills to achieve success in the field of mathematics.

The impact of the learning process in such a way is the low mathematical ability and mathematical thinking ability of students. Related to this, based on the results of an international study Program for International Student Assessment (PISA) in 2012 showed that in general the ability of Indonesian students is very low in understanding complex information and problem solving (Kemendikbud, 2017).

Based on national exam results (UN) from several provinces, the result is still low, far from the desired expectations. This indicates that mathematics is still a difficult subject for students. Likewise the results of the student national examination scores for Riau Province is also low with an average of 53.04. Furthermore, the average value for the Pekanbaru mathematics study has an average of 55.58, it can be said that students' mathematical knowledge is still low. This shows the average national exam (UN) score is directly proportional to the results of the National Examination for the level of the Province and the city of Pekanbaru.

Based on the statement above, it shows that the student learning outcomes are not optimal due to the learning process that has not provided meaning to learning for students both horizontally and vartically. So in connection with this, it is necessary to manage learning which emphasizes both content. According to Marsuha (2007) the essence of cooperative learning is the occurrence of positive development and interdependence between group members.

Furthermore, to increase student interaction in completing group assignments, students should have knowledge of the tasks to be completed. Therefore, each group member should be given the opportunity to first think and understand their learning tasks. Just sharing ideas with colleagues. One of the cooperative learning models that emphasizes it is the cooperative learning model Think Pair Share (TPS), according to Fatmawati (2011) to improve student cooperation in groups one way is by the TPS cooperative learning model.

Determination of school rankings (High, Medium and Low) based on the results of the national exam (UN) which shows the level of ability of student learning outcomes that describe the ability of students in the school. Related to the ability of students according to Darhim (2004) that one of the best predictor factors for mathematics learning outcomes is the previous mathematics learning outcomes, and the role of other cognitive variables is not as large as the previous mathematics learning outcome variable. In connection with this, the innate ability of students is worthy of being a variable to be investigated. Winda et al. (2012) also stated that the influence of the application of TPS cooperative learning models to the understanding of concepts in mathematics learning can also develop students' abilities.

The objectives of this study are to describe the impact of the application of TPS type cooperative learning and conventional learning to the mathematics learning outcomes, to describe the impact of the application of cooperative learning type TPS and conventional learning to the mathematics learning outcomes in terms of the level of high, medium, and low school. Finally, this research is to describe the impact of the application of TPS type cooperative learning to students' mathematics learning outcomes viewed from the school level (high, medium, low).

2. Methodology

Quality learning process creates a conducive learning atmosphere that is students learning in pleasant conditions. This is in line with the opinion of Leonard (2013) that pleasant conditions in general will provide comfort for students, thus providing an opportunity to utilize the potential of students. The criteria for the learning device assess quality based on three aspects, namely: validity, practicality, and effectiveness. In line with the opinion of Fakhruddin et al. (2017), the LKS practicalities of data were obtained through the practicalities of the data which were given to teachers and students (Hasnah et al., 2019; Zulhelmi et al., 2019). The construct validity of this learning device was assessed by three experts from the University of Riau education lecturers. In line with the opinion of Yenita et al. (2017), Miftahul et al. (2019) that validation is done by three validator experts and revised based on the input from the validator.

To see the practicality of learning tools developed, it was implementated in the classroom. The practicality of learning devices was obtained from the field trials data. From the field trials, the results of observations were obtained from the learning process, the teacher's response questionnaire to the learning device, and the student's response questionnaire to the learning device (LAS) after attending the study.

This study aimed to determine the effect of the application of Cooperative Learning Model Type TPS to the learning outcomes of mathematics and mathematical disposition of class VII students of Pekanbaru City Junior High School. The type of

research used was experimental research Pre-test Post-test Control Group Design (Sugiyono, 2010)

Tabel 1. Pre-test Method Post-test Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	X_1	A	X_2
Control	X_3	B	X_4

Information:
X1 : Pretest score of the experimental class
X2 : Postest score of the experimental class
X3 : Pretest score of the control class
X4 : Postest score of the control class
A : Treatment of Cooperative Type TPS Learning Model
B : Treatment of Conventional Learning Models

The steps for implementing the Pre-test design Post-test Control Group Design that was used in this study are as follows:
1. At the initial stage, do the pretest to the students of the study sample.
2. Provide treatment, cooperative learning type TPS for the experimental class and conventional learning for the control class.
3. Give postest to all students of the study sample.

To determine the research sample, the study population data were grouped on high, medium and low schools. For the grouping of schools, the UN data of year 2016/2017 was used. The first one is sorted. To determine the school group based on the level used intervals with the following criteria.

a. High school : total UN $\geq \overline{X} + 0{,}5$ SB
b. Middle school level : $\overline{X} - 0{,}5$ SB $\leq$ total UN $< \overline{X} + 0{,}5$ SB
c. Low level school : total UN $< \overline{X} - 0{,}5$ SB
   Note: SB = Standard Deviation

Based on UN data of academic year 2016/2017, it was found that the average total value ($\overline{X}$) of the four subjects presented was 55.58 with standard deviation of (SB) 17.44. By using the above rules, the school level categories used are as presented in Table 3.5.

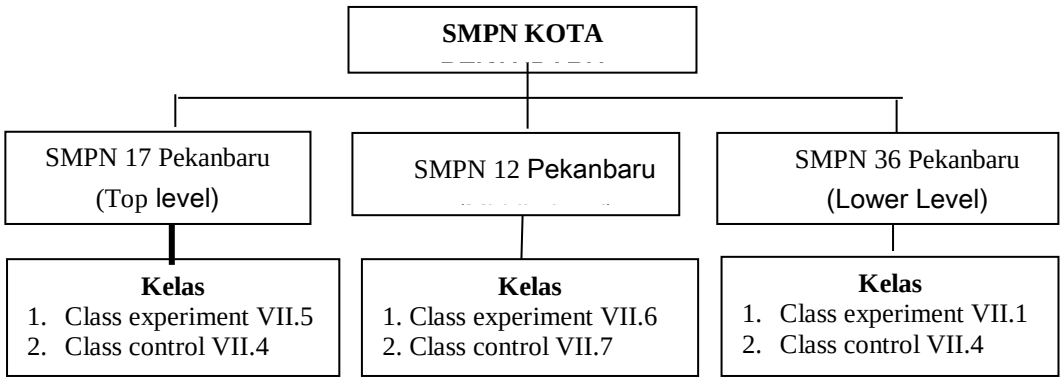
Tabel 2. School Level Level Criteria

Average school level level	Criteria
$UN \geq 64{,}3$	High
$46{,}86 \leq UN < 64{,}3$	Is being
$UN < 46{,}86$	Low

Because it is not possible to learn all the data in the population, the researcher determines the sample by purposive sampling. It is also known as the sampling technique that is sampling technique used by researchers if the researcher has certain

considerations in sampling or sampling for a particular purpose (Akdon et al. 2010). The considerations are (1). The distance between schools is not far apart. (2) The researcher wants to conduct direct research for the three schools, (3). The three schools are in the same zone for new student admissions.

After knowing the level of the school level, a purposive sampling technique was conducted at each level to determine the sample in the study. The selected schools were: SMPN 17 (the top level), SMP N 12 (the middle level) and SMPN 36 (the lower level). With the same technique, purposive sampling was also used to determine the class sample so that the sample obtained for SMP 17 Pekanbaru is VII.5 class as the experimental class and class VII.4 as the control class. For the SMPN 12, class VII.6 is as the experimental class and class VII.7 is as the control class while for SMPN 36, class VII.1 is as the experimental class and class VII.4 is as the Control class.



Picture 1. Research Sample Framework

Based on the sampling technique, it was determined that the sample of this study was VII grade for all selected school in the even semester of the school year 2017/2018. While in this study the data obtained were pretest and posttest data on learning outcomes and mathematical dispositions were analyzed using inferential statistical analysis techniques. Pretest data analysis techniques was used to test the hypothesis in this study which is at $\alpha = 0.05$. Pretest data was used to determine the type of data used to answer the hypothesis. If there is a difference or H_0 is rejected by pretest data between the experimental class and the control, the data used to test the hypothesis is the difference data from posttest and pretest. If there is no difference or H_0 is accepted, the data used to test hypotheses is posttest data. The statistical test used to test hypotheses relating to research problems is presented in Table 3:

Table 3. Summary of Hypothesis Testing at 5% Significance Level

Action Hypothesis	Required Data Type	Research Hypothesis	Type of Statistical Test
1	**2**	**3**	**4**
There are differences in mathematics learning outcomes of Middle Level School students who	X_2 and X_4	1	Two

receive TPS type cooperative learning with students who get conventional learning.			Average Difference Test
There are differences in mathematics learning outcomes of Middle Level School students who receive TPS type cooperative learning with students who get conventional learning are reviewed based on school level (high, medium, and low)	X_{2t} and X_{4t} X_{2s} and X_{4s} X_{2r} and X_{4r}	2	Two Average Difference Test
There are differences in the mathematics learning outcomes of High Level School students who take part in learning through the application of the TPS cooperative learning model in terms of high, medium and low school levels.	X_{2t} X_{2s} X_{2r}	3	One Path Anova

Information:
X_2 : Postes score of experimental class
X_4 : Postes score of the control class
X_{2t} : High school grade experimental grade score
X_{2s} : Postes score for medium level experimental class
X_{2r} : Postes scores for low-grade school experiments

3. Results and Discussion

To answer a number of problem which are presented in the introduction, an analysis and interpretation of the research data is needed. The main purpose of this study was to determine the effect of the application of the Think Pair Share (TPS) type of cooperative learning and conventional learning on the mathematics learning outcomes of VII grade students at the junior high school in Pekanbaru.

Through this research a number of data were obtained which include; (1) the results of the pretest score of the ability of mathematics learning outcomes of the experimental class and control class, (2) the results of the posttest score of the ability of mathematics learning outcomes of the experimental class and control class, so that the data analysis will be presented is the analysis of student ability data, analysis of learning interaction data.

Validation of Research Instrument Learning Devices

Before research the learning device and research instruments were first validated. The aim is to obtain learning tools and research instruments that are valid and appropriate to use in the research. The summary of the results of the learning device validation is presented in Table 4.

Table 4. Results of Learning Device Validation by Experts

No	Learning Tools	Value Average	Level of Validity
1	Syllabus	4,59	Very Valid
2	Learning Implementation Plan (RPP)	4,50	Very Valid

3	Student Activity Sheet (LAS)	4,45	Very Valid

Based on the results of the learning device validation, it was found that the learning device has a very valid level, meaning that the learning device is good for use in the learning process. While for the practicality category according to the students' responses, the overall practicality value was 3.39 with the practical category and the practicality category according to the teacher's response resulted in an overall practicality value of 48.33 with the practicality category.

Student Learning Outcomes

The learning outcome test consists of pretest and posttest. The mathematics learning outcomes pretest is given before the implementation of learning, while the postes are given after the implementation of learning. Processing and analysis of pretest and posttest data aims to determine the increase in student learning outcomes before and after obtaining TPS learning and conventional learning in the experimental class and the control class. The following will explain some analysis of mathematics learning outcomes in the experimental class and the control class.

Analysis of Data on Pretest Learning Outcomes; Normality and Homogeneity

Tests for normality and homogeneity of pretest tests of mathematics learning outcomes of students in the experimental class and control class aimed to determine whether the data obtained from the pretest test were normally distributed or not and there were differences in the results of pretest tests on the experimental class and control of the school level. The results of testing the normality of mathematics learning outcomes in the experimental class and control class are presented in Table 5:

Table 5. Pretest Data Testing with One Direction Anava and Normality

No	N	Mean	Std. Deviation	Kolmogorov-Smirnov Z	Homogenity test	Test	
						F	Sig
1	218	38,94	21,68	0,585	0,105	34,73	0,000

Based on Table 5, it is found that in the experimental class and control class with Kolmogorov-Smirnov Z of $p = 0.585 > \propto = 0.05$, the data variance is normal, whereas to see the data is homogeneous between experimental class data and control class ($p = 0.105 > \propto = 0.05$) then the variance of the data is declared homogeneous. Whereas with a value of $f = 34.73$ with $p = 0,000 < \propto = 0.05$ then Ho is rejected, in other words there is interaction between the experimental class and the control for different school levels. So thus to answer the data analysis for student mathematics learning outcomes, the difference data between posttest data and pretest data will be used.

Analysis of Learning Outcomes Data

The analysis of learning outcomes in this study is as follows:

1. There are differences in the mathematics learning outcomes of Pekanbaru City Middle School students who receive TPS type cooperative learning with students who receive conventional learning.The results of the testing of the mathematics learning outcomes of students in the experimental class and control class using the t test are presented in Table 6:

Table 6. Study Result Analysis of Experimental Classes and T Test of Control Classes

No	Group	N	Mean	Std. Deviation	F	Sig	t	Sig. (1-tailed)
1	Experiment	110	16.436	23.717	3.812	0.052	-0.144	0.4425
2	Control	108	16.864	20.008				

Table 6 shows that the value of p = 0.052> ∝ = 0.05 thus the results of student mathematics learning are homogeneous data variances. Whereas to see differences in student learning outcomes between the experimental class and the control class with a value of p = 0.4425> ∝ = 0.05 then Ho is accepted, Thus the results obtained are no difference between the experimental class and the control class. The same results were also stated by Siska et al. (2013) that there was no difference in the initial ability between TPS type cooperative learning and conventional learning. According to the same results stated by Siti et al. (2013) that there is no influence between the uses of TPS type cooperative learning model on student learning achievement. While students who were given learning using cooperative learning models type TPS as well as students given conventional learning models with a scientific approach according to Edy et al. (2016).

2. There are differences in mathematics learning outcomes of Pekanbaru City Middle School students who receive TPS type cooperative learning with students who get conventional learning that are reviewed based on school level (high, medium, and low).
   a. There are differences in the mathematics learning outcomes of Pekanbaru City Junior High School students with TPS cooperative learning models and using conventional learning models viewed from high school level? The following is an analysis of the mathematics learning outcomes of students in the experimental class and the control class viewed from the school level presented in Table 7.

Table 7. Analysis of High School Level Learning Outcomes of the T Test

No	Group	N	Mean	Std. Deviation	F	Sig	t	Sig. (1-tailed)
1	Experiment	39	15,000	25,946	13,826	0,000	-0,253	0,4005
2	Control	39	16,205	14,511				

Based on table 7, it is obtained that the value of p = 0,000 <∝ = 0.05 means that the data is not homogeneous, whereas to see differences in learning outcomes between the experimental class and the control class at high school with a value t = -0.253 with a value p = 0 4005> ∝ = 0.05, then Ho is accepted as having no difference between the experimental class and the control class in terms of high school level. According to the same results, Edy et al. (2016) stated that in students with high achievement motivation levels, the TPS learning model with a scientific approach provides learning achievements that are as good as PBL learning models with scientific approaches and classical learning with a scientific approach.

b. There are differences in the mathematics learning outcomes of Pekanbaru City Junior High School students with the TPS cooperative learning model and using conventional learning models viewed from the middle school level? The test results concerning the analysis of mathematics learning outcomes of students in the experimental class and control class were reviewed from the school level while in Table 8.

Table 8. Analysis of School Learning Outcomes for Medium Level T Test

No	Group	N	Mean	Std. Deviation	F	Sig	t	Sig. (1-tailed)
1	Experiment	36	8,806	18,172	0,109	0,743	-2,813	0,003
2	Control	36	20,083	15,763				

Table 8 about the T test of the difference in posttest scores and the pretest of student learning outcomes tests obtained that the value of p = 0.743> ∝ = 0.05, the data variance is homogeneous. Whereas differences in mathematics learning outcomes between students in the experimental class and the control class at the middle school level obtained p = 0.006 <∝ = 0.05, H1 was accepted, the students' mathematics learning outcomes in the experimental class and the control class were viewed from the school level while there were differences. The same result was also stated by Marlina et al. (2014) that there was an interaction between TPS type cooperative learning and conventional learning with a moderate class review. The same results were also expressed by Husna et al. (2013) that students 'interest in learning both high, moderate, and rending interests had an influence on students' learning achievement using the TPS type cooperative learning model. According to Adekunle (2015) this implied that students' achievement in chemistry, as a result of exposure to the different teaching strategies, was sensitive and varied significantly among students with low, medium, high cognitive entry behavior.

c. Are there differences in mathematics learning outcomes of Pekanbaru City Junior High School students with TPS cooperative learning models and using conventional learning models in terms of low school level? The following is a table of test results concerning Analysis of mathematics learning outcomes of students in the experimental class and the control class in terms of the low school level presented in Table 9.

Table 9. Analysis of Low Level School Learning Outcomes T Test

No	Group	N	Mean	Std. Deviation	F	Sig	T	Sig. (2-tailed)
1	Experiment	35	25,886	23,559	2,852	0,096	2,776	0,007
2	Control	33	11,727	18,305				

Table 9 shows that the T test of the post-test difference and the pretest of the student learning outcomes test, it is obtained p = 0.096> ∝ = 0.05, then the data variance is homogeneous whereas to see differences in student learning outcomes between the experimental class and control class p = 0 , 0035 <∝ = 0.05, H1 is accepted. There is an interaction between the experimental class and the control class at the lower level schools. Thus, there are differences in the mathematics learning outcomes of the experimental class and the control class. The same result was also stated by Marlina et al. (2014) that there was an interaction between TPS type cooperative learning and conventional learning with an overall review. The same results were also stated by Siti et al. (2013) that students 'interest in learning both high, moderate, and rending interests had an influence on students' learning achievement using the TPS type cooperative learning model. According to Himmatul et al. (2017), it can be concluded that each variable has a different level of different mathematical intelligence affect different, mathematical achievement with student Mathematical-logical intelligence is better than students with average and low mathematical-logical intelligence

3. Is there a difference in the mathematics learning outcomes of Pekanbaru City Junior High School students with the TPS cooperative learning model viewed from the medium and low high school level? Table 10 is the result of testing about the analysis of students' mathematics learning outcomes in the experimental class in terms of the high, medium and low school levels presented in Table 10.

Table 10. Hypotheses 5 One-Way Anova Test

No	Nilai	Mean	Std. Deviation	Mean Square	Uji Homogenitas	Uji Perbedaan F	Sig
1	78	39,23	32,578	2788,326	0,422	2,922	0,056
2	72	34,11	31,147				
3	68	46,59	28,614				
Total	218	39.90	31,163				

Based on table 10, it is obtained that the sig value p = 0.422> ∝ = 0.005, the data of hypothesis 3 in the experimental class has a homogeneous variance. Whereas to see the difference in learning outcomes of the experimental class students viewed from high, medium and low levels with an F value of 2.922 with p = 0.056> ∝ = 0.05 then H_o is accepted in other words there is no difference between the experimental classes for different school levels.

4. Conclusion

The results of the research show that there is no difference in the mathematics learning outcomes of Pekanbaru City Junior High School students who receive TPS type cooperative learning using conventional learning. There is no difference in the mathematics learning outcomes of Pekanbaru City Middle School students who receive cooperative learning type TPS and conventional learning based on high school level while for medium and low schools there are differences in mathematics learning outcomes of Pekanbaru City Middle School students who receive TPS type cooperative learning and conventional learning. There is no difference in the mathematics learning outcomes of Pekanbaru City Middle School students who take part in learning through the application of the TPS cooperative learning model in terms of high, medium and low school levels.

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