

## **THE EFFECTIVENESS OF MATHEMATICAL LEARNING IN LOGIC COMPETENCY WITH PROBLEM BASED LEARNING THROUGH THE COOPERATIVE MODEL OF TYPE THINK-PAIR-SHARE IN TERM OF STUDENT ACHIEVEMENT AND STUDENT CONFIDENCE OF GRADE X SMA NEGERI 1 DEPOK**

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### **Abstract**

The purpose of this research were to describe the effectiveness of mathematical learning in logic competency with problem based learning through the cooperative model of type think pair share (TPS) in term of student achievement and student confidence. This research used quasi-experimental with pre-test and post-test control group design. Its population was all students of grade X SMA Negeri 1 Depok. The samples were class XD as experiment class which given problem based learning through the cooperative model of type TPS and class XB as control class whivh given conventional learning approach. The instruments used in this research were learning instrument, i.e. lesson plan and student worksheet, pre-test and post-test as test instrument to measure student achievement, observation sheets and questionnaire confidence as non-test instrument. The hypotheses testing used were one sample t-test and independent sample t-test. The results indicated that: (1) mathematics learning with problem based learning through the cooperative model of TPS was effective in terms of student achievement, (2) mathematics learning with conventional learning approach was effective in terms of student achievement, (3) mathematics learning with problem based learning through the cooperative model of TPS was not effective in terms of student confidence, (4) ) mathematics learning with conventional learning approach was not effective in terms of student confidence, and (5) mathematics learning with problem based learning through the cooperative model of TPS was not more effective than mathematics learning with conventional learning approach in terms of student achievement.

Keywords: *mathematics learning, problem based leraning, cooperative model of type think pair share, student achievement, student confidence*

### **INTRODUCTION**

Mathematics is a important science. Humans need a mathematical science in almost daily activities. Many problems around us that can be solved by mathematics. For example, algebra can be used to determine the income of a business, arithmetic is used for calculation, geometry is used to calculate the area of a field. Therefore math is very important because math can help students to learn the other sciences. Muijs (2008: 212) reveals "Mathemathics is also a prime vehicle for developing children's logical thinking and higher order cognitive skills." Based on these statements, logical

thinking ability and high level cognitive skills can be learned through mathematics.

A good mastery of mathematics is supported with good mathematical learning. The success of mathematics learning can be showed from the level of understanding, mastery of the material, and student achievement. High understanding and mastery of the material cause high student achievement. According to Nana (2011: 22), achievement is the abilities of the students after receiving their learning experience. The learning achievement shows how far students can reach the goal of learning.

Mathematics learning achievement in SMAN 1 Depok still relatively low. Many students still have difficulty understanding the learning of mathematics. Students feel difficult to mastering cognitive competency and affective abilities. In the cognitive competency, student learning outcomes is still less than optimal. It can be seen from the results of odd math final exam grade X SMA Negeri 1 Depok of year 2015/ 2016. The highest value of the results is 95 and the lowest score is 25. The average value of the results is 53.19 with a standard deviation of 13.76. The average results of odd math final exam grade X SMA Negeri 1 Depok is still low.

Besides still not mastered the cognitive competency, students is also not mastered the affective ability. One of the affective ability that needs to be owned by the students is student confidence. Based on the practice field experience, students SMAN 1 Depok still have an attitude of low confidence. This is demonstrated by the many students who dared to present the results of work Math in the class. Students feel uncertain about the work they have done. Students are afraid to come forward in a class even though the results of its work is correct.

Self-confidence is one attitude that is essential for the students. It is caused attitude of self-confidence will facilitate students' learning process and express their ideas. Some teachers are sometimes too focused how to develop the cognitive abilities of

students in a learning activity. In the implementation of the mathematics lesson, each student has the confidence levels vary. It can be seen from the students' attitude when responding to questions or tasks assigned by the teacher. Bandura (Woolfolk, 2007: 395) states that when students given the task by the teacher, the student who have high confidence tend to try to resolve it. Conversely, students who have low confidence more likely to give up easily when get the task.

If the level of confidence associated with the student, the student who have high confidence will soon resolve a problem given then without doubtful give their opinion. Students who have low confidence will be lazy solve the problems and lazy give their opinion to the teacher. In addition, there are also students who do not dare give opinion even though he knows how to resolve the problem. In this case, the students lack confidence because of they feel fear when his opinion was wrong.

Based on the practice field experience the students still have low confidence so that cause low learning achievement. Students tend to be passive and not interested in following the lesson. Therefore we need a method of learning that can improve learning achievement in mathematics. Problem-based learning can be one of the solutions in the selection method of learning mathematics. According Miftahul (2013: 271), problem-based approach is more emphasis on a process to solve the problem. This approach puts

students to solve problems around the lives of students. Students become easier to understand a mathematical concept that can increase the learning achievement of mathematics.

To solve the problem well, students should be more active in the learning process. Warsono and Hariyanto (2012: 12) say that the active learning facilitates students to do meaningful learning experiences. Students who are actively involved in the learning process can improve the attitude of their confidence. To awake students' activity when the learning process need a learning model. According to Erman (2001: 60) model of learning that involve students actively in learning, both mentally, physically, socially, and according to the situation can achieve the learning objectives that have been planned.

One model of learning that can be applied is a cooperative learning model. According Tukiran (2012: 55), cooperative learning is a teaching model that gives students the opportunity to work in the team with their friends when do the task.

According to Slavin (1995, 7) cooperative learning is divided into four categories, namely students achievement devisions teams (STAD), jigsaw, investigative group, and the structural approach. One type of cooperative learning structural approach is a model think pair share (TPS) is a learning model that consists of stages of thinking, pairing, and sharing. This model has the characteristic to optimize

student participation becomes active and triggers students to give opinion. The Literacy and Numeracy Secretariat (2010: 7) states that think the stage can enhance students' response when faced with a mathematical problem, pair can make students dare give opinion , and share give opportunity for students to be able to express their opinions in front of the class. Therefore, this learning model expected can improve students' attitudes confidence.

Based on the problems description above, this study was conducted to determine the learning of Mathematics which is more effective to improve learning achievement of Mathematics and confidence between students who take the Mathematics lesson-based problems using cooperative model of TPS and learning mathematics with learning conventional learning approach. Mathematical material used in this study is math logic. This mathematics learning is expected to provide opportunities for students to be actively involved in the learning process and improve learning achievement and confidence.

## METHODS

### Research Design

This research was a quasi-experimental research. The research design used was *pretest and post-test control group design*.

Table 1. Research Design

Group	Pre-test	Treatment	Post-test
Experiment	$Y_1$	X	$Y_2$
Control	$Y_1$		$Y_2$

$Y_1$  : Initial ability

X : Treatment given

$Y_2$  : Final ability

### **Variables**

The variables consisted of independent and dependent variables. The independent variable was learning approach which varied as problem based learning through the cooperative model of TPS and conventional learning approach. The dependent variable was student achievement and confidence on math logic.

### **Population and Sample**

The population of this research was all the students of grade X SMA Negeri 1 Depok. The sample were classes XB and XD which randomly selected using cluster random sampling technique, provided that the classes were normal and homogeneous. Class XB was the control class which given conventional learning approach, while the experiment class was class XD which given problem based learning through the cooperative model of TPS.

### **Time and Place**

This research was conducted at SMA Negeri 1 Depok, Sleman, DIY in the second semester of academic year 2015/2016 held on January 2016-February 2016.

### **Instruments**

The instruments used in this research were learning instrument, i.e. lesson plan and

student worksheet, pre-test and post-test as test instrument to measure student achievement. Observation sheets and confidence questionnaire were used to observe and know level of confidence during the learning process.

### **Data Analysis Techniques**

That The data collected were analyzed by making the description of the data that consisted of the early stage description and the end of stage description. The early stage description consisted of normality and homogeneity test. Normality test was performed by using the *Kolmogrov-Smirnov* test with a significance level  $\alpha=0.05$ . The homogeneity test was performed by using the *Levene* test with a significance level  $\alpha=0.05$ . The end stage description was hypothesis test. The first until fourth hypothesis test were done to know the effectiveness of learning in the control and experiment class. The test used was *one sample t-test* by comparing the mean (average) of each class to the minimum standard value (KKM), i.e 75. The fifth and sixth hypothesis test was done to know the difference between means of the two classes, which used *independent sample t-test*. All the test were done using SPSS 21.00.

## **RESULT AND DISCUSSION**

The learning processes of the both classes were conducted by researcher herself according to the lesson plan for each class.

The overall learning processes were in accordance with the lesson plan.

### Description Data

The data collected in this research consisted of pre-test and post-test result, early and end of confidence score result of the experiment class and control class.

Table 2. Pretest and Posttest Result

Description	PBM TPS Class		Conventional Class	
	Pretest	Posttest	Pretest	Posttest
Mean	28,43	78,20	18,20	82,20
Max	54	100	38	97
Min	4	51	4	55
Standard deviation	14,34	13,31	10,98	13,19
Variance	205,7	177,33	120,75	174,08

Based on the table 2, the means of pretest and posttest of the both classes were not significantly different, with the standard deviation almost the same.

Table 3. Early and End Score Confidence

Description	PBM TPS Class		Conventional Class	
	Before	After	Before	After
	Threatment			
Mean	120,27	123,13	119,31	121,42
Standard deviation	11,92	10,75	9,77	10,70
Max	144	147	145	142
Min	100	106	102	94
Variance	142,13	115,01	95,50	114,49

Based on the table 3, confidence score of the both classes were almost the same. After treatment confidence score of experiment class higher than control class.

Analysis on the pretest and early confidence score result of the both class showed that the classes were normally distributed. It was indicated by the significant value  $> 0,05$ . The variance of both classes were equal (homogenous), since the significant value was greater than  $0,05$ .

The posttest and end of confidence score analyzed using *one sample t-test* and *independent sample t-test* to know the effectiveness of learning in the experiment class which given problem based learning through the cooperative model of TPS and the control class which given conventional approach, and to know the difference between means of the two classes.

The analysis problem based learning through the cooperative model of TPS in term of student achievement can be seen in the table below.

Table 4. One Sample t-test for PBM TPS in term of student achievement

df	Sig
29	0,038

Based on Table 4, the value of sig  $< 0,05$ . It means that problem based learning through the cooperative model of TPS was effective in term of student achievement.

Rejeki ( Hasmi, et al, 2011) states that the cooperative learning is a good foundation for improving boost student achievement . Students work together with their friends. Students are given the opportunity to think and interact. Collaboration with peers can provide the motivation to learn , so that students become more active . In addition , the effectiveness of PBM TPS to improve mathematics learning achievement of students is also supported by research that has been done before. For example Eprina research ( 2015) of the student SMAN 2 Bantul indicates that learning model TPS was effective in terms of achievement in Mathematics.

The second hypothesis done to know the effectiveness of learning in the control class in term of students achievement.

Table 5. One Sample t-test for conventional approach in term of students achievement

df	Sig
24	0,004

Based on Table 5, the value of sig < 0,05. It means that conventional approach was effective in term of student achievement.

It's caused conventional approach put students as learning objects . Students receive all the explanations on the whole with intact so that students more easily understand the material . Students are listening to a lecture from the teacher. Ausubel ( Eggen , 2012: 401 ) state that lectures can be effective if the

goal is to give students information that requires many hours to understand a material.

The third hypothesis done to know the effectiveness of learning in the PBM TPS in term of convidence.

Table 6. One Sample t-test for PBM TPS in term of convidence.

df	Sig
29	0,973

Based on Table 6, the value of sig > 0,05. It means that PBM TPS was not effective in term of convidence.

This is because confidence can not be changed quickly . Characteristics of diverse learners, can not be changed by short learning model. Muhibbin (2012: 109 ) state that learning is an activity that process, and happened process of gradual change.

The fourth hypothesis done to know the effectiveness of learning in the control class in term of convidence.

Table 7. One Sample t-test for conventional approach in term of convidence

df	Sig
25	0,405

It's because in a conventional classroom learning process does not involve students actively. Wina (2006: 190-191 ) states that conventional learning causing students hard to develop social skills.

The fifth hypothesis done determine the learning of Mathematics which is more

effective to improve learning achievement both two classes.

Table 8. Independent Sample t-test for Both Classes in term of Achievement

Class	Sig
Student Achievement	0,327

Based on Table 8, the value of sig  $> 0,05$ . It means that problem based learning through the cooperative model of TPS was not more effective than mathematics learning with conventional learning approach in terms of student achievement.

There are students who do not have a high awareness to get involved as a whole in the process of group discussions, so it can affect their own learning process within the group .It happen due to develop group consciousness takes a long time in Wina opinion (2006: 249 ). These factors can affect students' understanding of the given problem , thus affecting the construction process knowledge. Consequently, the learning achievement of mathematics students in the experimental class was not optimal. In addition , other factors that could affect the outcome of these studies was the absence of students when learning takes place , or simply follow some of the learning process and asked for permission to attend other activities outside of school. The factors above are deficiency to this research.

## CONCLUSIONS AND SUGGESTION

### Conclusions

Based on the result of data analysis and the discussion, the conclusions are as follows.

1. The mathematics learning with problem based learning through the cooperative model of TPS was effective in terms of student achievement.
2. The mathematics learning with conventional learning approach was effective in terms of student achievement.
3. The mathematics learning with problem based learning through the cooperative model of TPS was not effective in terms of student confidence.
4. The mathematics learning with conventional learning approach was not effective in terms of student confidence.
5. The mathematics learning with problem based learning through the cooperative model of TPS was not more effective than mathematics learning with conventional learning approach in terms of student achievement.
6. Both mathematics learning with problem based learning through the cooperative model of TPS and mathematics learning with conventional learning approach were not effective in terms of confidence.

### Suggestions

Based on the result, then the suggestions of the researcher is for other researchers, to anticipate for the things that might happen during the research, to

maximize the observation of the research, and to add variable when conducting research related to the topics.

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