



## THE EFFECT OF COOPERATIVE LEARNING MODELS ON INCREASING LEARNING RESULTS AND STUDENT ACTIVITIES IN MATHEMATIC LESSONS

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### ARTICLE INFO

o-ISSN: 2528-2026  
p-ISSN: 2528-2468  
Vol. 4, No. 1, June 2019  
URL: <http://doi.org/10.31327/jomedu.v4i1.883>

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### *Suggestion for the Citation and Bibliography*

#### *Citation in Text:*

Noor & Munandar (2019)

#### *Bibliography:*

Noor, N.A., & Munandar, I. (2019). The Effect of Cooperative Learning Models on Increasing Learning Results and Student Activities in Mathematic Lessons. *Journal of Mathematics Education*, 4 (1, June), 21-26.

### Abstract

This study aims to determine the effect of cooperative learning models on improving learning outcomes and student learning activities in mathematics. This type of research is quantitative. The research design used was quasi-experimental by taking three sample classes. Two as the experimental class that received the treatment of cooperative learning model type Team Assisted Individualization (TAI) and Think Pair Share (TPS) type. One control class received conventional method treatment. The sample was taken from class X Kosgoro Vocational School Karawang Regency with a sample size of 90 students. Data was taken by post test by using objective test instruments with 25 multiple choice items for learning mathematics matrix material and for student learning activity data using a questionnaire consisting of 30 items in the Likert point 5. The results of data analysis showed that TAI learning was better than Conventional, can be proved statistically (LSD table) that the mathematics learning outcomes are Sig = 0.002 and for learning activities Sig = 0.000, both are smaller than  $\alpha = 0.05$ . This proves that TAI learning is better than conventional seen from the results of learning and student learning activities. Learning TPS is better than Conventional, can be proven statistically (LSD table) that for mathematics learning outcomes obtained Sig = 0.684 greater than  $\alpha = 0.05$  and for learning activities obtained Sig = 0.002 smaller than  $\alpha = 0.05$ . This proves that TPS learning is better than Conventional seen from student learning activities even for student learning outcomes there is no difference. Based on the data analysis, it can be concluded that the application of cooperative learning models can influence the increase in mathematics learning outcomes and student learning activities.

**Keywords:** Cooperative Learning, Mathematics Learning Results, Student Learning Activities

## A. Introduction

The world of education is currently concentrating on the quality of education in improving teaching and learning activities (KBM) in which there are teachers and students as human elements which in fact have many human elements such as abilities, skills, philosophy of life, motivation, etc. that differ from one to another. In the learning process, students learn from their experience, construct knowledge, then give meaning to that knowledge. Mathematics which are axiomatic deductive and depart from abstract things, tend to be difficult to be accepted and understood by students. If students are faced with a certain material while he is not ready to understand it, then he will not only fail to learn but learn to scare, hate, and avoid lessons related to the material. Most students have not been able to connect the material learned with the knowledge used.

According to Mullis et al (2011) the results of a study conducted by Trends in International Mathematics and Science Studies (TIMSS), released at the end of 2011, found that the mathematics achievement of students in Indonesia was 38 of 42 countries with average scores of students in Indonesia is 386 where the overall average score is 500. The scores of Indonesian students fell by 11 points from 2007. Indonesia's position is much lower than Korea (613) in the first position. Low quality of students in mathematics Mathematics education in Indonesia is experiencing a paradigm shift, where positive transformation takes place in the Mathematics education curriculum in elementary and secondary schools. In addition to curriculum development, various efforts have been made by the government to improve the quality of learning in schools. The government is also assisted by various parties concerned with mathematics education. Among these efforts are: (1) teacher training, (2) teacher education qualifications, (3) planting new models or teaching and learning methods, (4) study of student difficulties and errors in learning mathematics, however, these efforts have not yet produced optimal results.

In learning various types of learning models are known, one of the learning models that allows students to interact with each other is the cooperative learning model. The cooperative learning model will be able to provide new nuances in the implementation of learning by all fields of study or subjects taught by the teacher. Because cooperative learning and some results of research both education experts inside and outside the country have had a broad impact on success in the learning process. The impact is not only on the teacher but also on the students, and educative interaction arises and shows the roles and functions of the teacher and students. The role of the teacher in cooperative learning as a facilitator, moderator, organizer, and mediator is clearly visible. This condition was once and the student's function was seen, the involvement of all students would be able to provide an active atmosphere and learning seemed democratic, and each student had a role and would provide his learning experience to other students.

According to Trianto (2007) there are two reasons why cooperative learning is the choice, first, some research results prove that the use of cooperative learning can improve student learning achievement while increasing the ability of social relations, fostering an attitude of accepting self-deficiencies and others, and increasing self-esteem. Second, cooperative learning can realize students' needs in learning to think, solve problems, and integrate knowledge with skills. Lasmawan in Dimiyati, (2006) states that cooperative learning (cooperative learning) is a learning model where students learn and work in small groups collaboratively whose members consist of six people, with a cooperative heterogeneous group structure that can realize students' needs in learning think, solve problems, and integrate knowledge with skills.

The cooperative learning model that will be applied in this study is the TAI type of cooperative learning model and TPS cooperative learning model. The cooperative learning model of the Team Assisted Individualization (TAI) type has a rationale which is to adapt learning to individual differences related to ability and student achievement. This method is included in cooperative learning. In the TAI learning model, students are placed in small groups (4 to 5 students) that are heterogeneous and then followed by giving individual assistance to students who need it. this learning designs a form of group learning in a comprehensive way the students work in groups. TAI cooperative learning students are trained to be responsible for solving problems and motivating each other for achievement. Think Pair Share is a cooperative learning model that gives students time to think and respond and help each other. This model introduces the idea of "wait or think time" on the interaction elements of cooperative learning which is currently one of the powerful factors in increasing students' responses to questions. The benefits of TPS include: (1) allowing students to work alone and work with others; (2) optimize student participation; and (3) provide opportunities for students to show their

participation in others. Skills that are generally needed in this strategy are sharing information, asking questions, summarizing other people's ideas, and paraphrasing. Think-Pair-Share has procedures that explicitly give students time to think, answer, help each other. Thus, students are expected to be able to work together, need each other, and interdependent on small groups cooperatively.

Team Assisted Individualization (TPA) and Think-Pair-Share (TPS) are suitable for use in high schools and vocational schools because the condition of students who are still in their teens makes them like new things for them and are more open to peers in solving problems they face.

## **B. Literature Review**

Slavin (2008) argues that cooperative learning can be explained and several perspectives, namely motivational perspective, social perspective, cognitive development perspective, and cognitive elaboration perspective. The motivational perspective means that the rewards given to groups allow each group member to help each other. Thus, the success of each individual is basically the success of the group. This kind of thing will encourage each group member to fight for the success of the group.

The TAI type cooperative learning model was developed by Slavin (2008) in his *Cooperative Learning: Theory, Research and Practice*. When the teacher delivers a lesson to students with diverse backgrounds, it is likely that some students do not have the ability to learn the lesson and will fail to benefit from the method. Other students may even know the material, or can learn it very quickly so that the time spent learning for them is just a waste of time. Slavin made this model for several reasons; (1) this model combines cooperative efficacy and individual teaching programs, (2) this model puts pressure on the social effects of cooperative learning, (3) TAI is structured to solve problems in teaching programs, for example in terms of individual student learning difficulties. Team members use answer sheets that are answered together. Discussions occur when students question each other's answers to their teammates. Think Pair Share (TPS) was developed by Frank Lyman and his colleagues from the University of Maryland. Think Pair Share is a cooperative learning model that gives students time to think and respond and help each other. This model introduces the idea of "wait or think time" on the interaction elements of cooperative learning which is currently one of the powerful factors in increasing students' responses to questions (Jumannta, 2011). Whereas according to Shoimin (2014) Think-Pair-Share has procedures that explicitly give students time to think, answer, help each other. Thus, students are expected to be able to work together, need each other, and interdependent on small groups cooperatively.

According to Ruseffendi (1990) mathematics learning activities in schools begin with the presence of a number of stimuli that intentionally or unintentionally will cause an emotional response in the individual concerned. This response stimulus will be the continuation of mathematics learning activities to the highest type, namely learning problem solving. Gagne further argues that "each learning occurs in four phases, namely understanding, mastery, memory and re-disclosure.

Activities in learning have great benefits for students. The following is the principle of benefit according to Hamalik (2008) as follows: (1). Students look for their own experience and immediately experience themselves (2). Doing it yourself will develop all personal aspects of students. 3). Fostering harmonious cooperation among students which in turn can facilitate group work. (4). Students learn and work based on their own interests and abilities. (5). Foster cooperation between students both in learning and organization. (6) Learning and learning are carried out in a realistic and concrete manner, so as to develop critical and dynamic thinking.

## **C. Methodology**

The method used is quantitative by using the Quasi Experiment design (quasi-experiment) that is research that cannot provide full control. The sample size is 90 respondents consisting of three cluster random classes from four classes X AP Kosgoro Vocational School Karawang Regency. The three sample classes are divided into two experimental classes given treatment by using the TAI learning model and TPS in a control class given treatment using lecture and question and answer (conventional) methods.

The data taken in this study is a post test of mathematics learning outcomes of students, the subject matter of matrix operations using objective test instruments 25 items of multiple choices and for learning activities students use questionnaires totaling 30 items using a 5-point Likert scale. The collected data is then carried out a prerequisite test of data analysis on

normality test and homogeneity test. To test the statistical hypothesis using a one-way ANOVA test.

#### D. Findings and Discussion

##### 1. Findings

The test results of data analysis of mathematics learning outcomes and student activities using one-way ANOVA and SPSS.20 help can be seen in the following table out put,

Table 1. Mathematics Learning Outcomes and Student Learning Activities due to Conventional Treatment, TPS and TAI

		Sum of Squares	df	Mean Square	F	Sig.
Learning outcomes	Between Groups	151,089	2	75,544	7,583	,001
	Within Groups	866,700	87	9,962		
	Total	1017,789	89			
Activity Students	Between Groups	3294,289	2	1647,144	16,334	,000
	Within Groups	8773,000	87	100,839		
	Total	12067,289	89			

Based on the results of the one-way ANOVA test (table 1), the value of the Sig of learning outcomes is smaller than  $\alpha$  or ( $0.001 < 0.05$ ). This means that there are significant differences in students' mathematics learning outcomes from the three treatments (Conventional, TPS and TAI). And for the value of the Sig activity, the scars are smaller than  $\alpha$  or ( $0,000 < 0,05$ ). This means that significant differences in learning activities from the three practices (Conventional, TPS and TAI).

Table 2. Differences in the results of Conventional Treatment, TPS and TAI for Mathematics Learning Outcomes and Learning Activities

Dependent Variable	(I) PERLAKUAN	(J) PERLAKUAN	Mean Difference (I-J)	Std. Error	Sig.
Hasil belajar	KONVENSIONAL	TPS	,333	,815	,684
		TAI	-2,567*	,815	,002
	TPS	KONVENSIONAL	-,333	,815	,684
		TAI	-2,900*	,815	,001
	TAI	KONVENSIONAL	2,567*	,815	,002
		TPS	2,900*	,815	,001
Aktivitas siswa	KONVENSIONAL	Tps	-8,467*	2,593	,002
		TAI	-14,767*	2,593	,000
	TPS	KONVENSIONAL	8,467*	2,593	,002
		TAI	-6,300*	2,593	,017
	TAI	KONVENSIONAL	14,767*	2,593	,000
		TPS	6,300*	2,593	,017

Based on the results of the Post Hoc test (LSD) as in table 2. the findings are as follows:

##### a. Student Mathematics Learning Results

\* Conventional and TPS are Sig =  $0.684 > 0.05$ . This means there is no difference in student learning outcomes between those treated with conventional and TPS.

\* Conventional and TAI are Sig =  $0,000 > 0.05$ . This means that there are differences in student learning outcomes between those treated with conventional and TAI.

\* TPS and TAI are Sig =  $0.017 < 0.05$ . This means that there are differences in student learning outcomes between those given treatment with TPS and TAI.

##### b. Student Learning Activities

\* Conventional and TPS are Sig =  $0.002 > 0.05$ . This means that there is no difference in student learning activities between those treated with conventional and TPS.

\* Conventional and TAI are Sig =  $0.002 > 0.05$ . This means there is no difference in student learning activities between those given conventional treatment with conventional and TAI.

\* TPS and TAI are Sig =  $0,000 > 0.05$ . This means there is no difference in student learning activities between those treated with conventional TPS and TAI.

## 2. Discussion

The parameter of mathematics learning outcomes in this study is the ability of students to be measured cognitively during the learning process of the matrix which includes the achievement of the indicators so that students are expected to be able to; (1) determine the sum and subtraction results of two or more matrices, (2) determine the results of two or more matrices, (3) carefully and carefully solve the counting operations on the matrix. While the parameters for measuring student learning activities in this study are the activities of students in learning and learning both physically and spiritually which are related to the duties and obligations of the school including visual activities, oral activities, listening activities, writing activities, metric activities, mental activities, and emotional activities.

Think-Pair-Share (TPS) is one type of cooperative learning that has procedures that are set explicitly to give students more time to think, answer, and help each other. This type of learning model provides opportunities for students to express ideas and consider the most appropriate answers, and encourage students to improve cooperation between students. Application of cooperative learning type Think-Pair-Share (TPS) ability of students both individually and in groups can develop and provide a different atmosphere from conventional learning. TPS learning has given a new color to students' learning experiences from the saturation of students to be excited, and from fascists to be more active. Based on the results of this study found TPS learning, students individually and in groups are more active than conventional learning. This can be proven from the LSD table where the Sig value is 0.002 which is smaller than  $\alpha = 0.05$  or ( $0.002 < 0.05$ ). This finding is in line with the opinion of Imas Kurniasih and Berlin Sani (2015), many sides of the advantages of the TPS learning model, including; (1) provide many opportunities for students to think, answer, and help each other, (2) increase student participation in the learning process, (3) ease of interaction among students, (4) help each other with each other, make conclusions (discussions) and present in front of the class, (5) facilitate the teacher in monitoring students in the learning process, (6) the learning process becomes dynamic, more active in finding problems and finding answers.

The two alternative variations of the learning model (TAI and TPS) are learning models that can give a non-boring impression on learning mathematics in the classroom. The results of the study prove that TAI learning is better than Conventional learning and TPS. In addition, students are more active students are also more motivated and responsible individually and in groups for the assignments given by the teacher. Statistically, the TAI learning outcomes *meta far* exceed TPS and Conventional (19.33 16.23 16.67). And the average student learning activity is (110.33 104.03 95.97). This is reinforced from the ANOVA test results obtained Sig = 0.001 smaller than  $\alpha = 0.005$  ( $0.001 < 0.05$ ). This shows that there are significant differences between the mathematics learning outcomes that are conventional treatment, polling stations and TAI. For student learning activities also obtained Sig = 0,000 smaller than  $\alpha = 0.05$  ( $0,000 < 0,05$ ) This proves that there are differences in student activities between those that are conventional, TPS and TAI. The differences from each of the three treatments will be proven from table 4. LSD as follows: (1) For mathematics learning outcomes, TAI is better than TPS and Conventional. This is obtained from the Sig = 0.001 and 0.002 values smaller than  $\alpha = 0.05$ . For student learning activities TAI is also superior from TPS and Conventional. This is obtained from Sig = 0.017 and 0.000 smaller than  $\alpha = 0.05$ . (2) For the results of the mathematics learning between TPS and Conventional there is no difference, this is obtained from the Sig value = 0.684 smaller than  $\alpha = 0.05$ . However, for student learning activities TPS is better than Convention, this is obtained from Sig = 0.002 smaller than  $\alpha = 0.05$ .

## E. Conclusion

1. From the results of the observations during the study found the findings that cooperative learning (TAI and TPS) can increase student motivation and activity during learning. seen their solidity and cooperation in their respective groups.
2. Learning TAI is better than Conventional, can be proven statistically (LSD table) that for mathematics learning outcomes there are Sig = 0.002 and for learning activities Sig = 0,000, both are smaller than  $\alpha = 0.05$ . This proves that TAI learning is better than Conventional seen from the results of  $\alpha = 0.05$  learning and student learning activities.
3. Learning TPS is better than Conventional, can be proven statistically (LSD table) that for mathematics learning outcomes obtained Sig = 0.684 greater than  $\alpha = 0.05$  and for learning activities obtained Sig = 0.002 smaller than  $\alpha = 0,05$ . This proves that TAI learning is better

than Conventional seen from student learning activities even for student learning outcomes there is no difference

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