

# The Effect of the STAD Type Cooperative Learning Model on Student Learning Outcomes on the Material of a Two Variable Linear Equation System

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**Abstract:** *The main problem that motivates this research is the low student learning outcomes on the material of the Two Variable Linear Equation System (TVLES) and the problem of using innovative learning models in SMP Negeri 1 Modounding which is still rare. This article contains a summary of the results of research on student learning outcomes in TVLES materials that follow learning using the Student Teams Achievement Division (STAD) cooperative learning model and conventional learning models. This study used a quasi-experimental method and data on student learning outcomes were captured with a learning outcome test instrument after the experiment. The population is class VIII SMP Negeri 1 Modounding, and the sampling consists of 2 (two) classes, namely class VIII C as the experimental class and class VIII D as the control class. The results showed that the use of the STAD type cooperative learning model had an effect on student learning outcomes. The facts show that the average learning outcomes of students who use the STAD Cooperative learning model are more than the average learning outcomes of students who use conventional learning models.*

**Keywords:** Learning Model, STAD-type Cooperative Model, Student Learning Outcomes, TVLES

## 1. Preliminary

In the field of national education, the government is currently trying to improve the quality of education both in terms of quality and quantity. One of the ways to improve the quality and quantity of education is the increased quality of learning. In an effort to improve the quality of education as a whole, improving the quality of learning becomes an important activity. The reason is that with these efforts what educators aspire to can be realized through changes in students' mindsets and behavior for the better. Piaget's theory states that all students grow and go through the same stages of development, but in their growth students have their own speed (Trianto, 2007). By remembering that each student has their own uniqueness, teachers must be able to understand the uniqueness of their students. Ideally, the teacher should be able to design a learning activity using the right learning model in order to be able to generate student motivation in order to achieve better learning outcomes.

Until now in learning at school, mathematics is a difficult and worrying subject for many students. These facts were obtained based on the results of interviews and observations with teachers or those who teach mathematics at SMP Negeri 1 Modounding. There are a number of topics or mathematical materials that are considered difficult to learn, one of which is the material for the Two Variable Linear Equation System (TVLES). Given the interrelationships between concepts in mathematics topics, the difficulty of understanding the material certainly affects student learning outcomes for mathematics subjects in general. Through these interviews and observations, it was identified a number of problems that affect student learning outcomes on the TVLES material, among others, students find it difficult to understand the facts, concepts, operations and principles contained in the TVLES material so that they have low ability to solve

problems in the TVLES material. Through observation, it appears that many students have problems in achieving learning objectives such as understanding the meaning of tribes in TVLES, understanding variables in TVLES, understanding coefficients and constants contained in an example of TVLES form. Information was found that students were in a hurry when solving TVLES questions, students were not careful enough when working on TVLES questions and students lacked basic knowledge about the TVLES concepts. In addition, it was revealed about the lack of student activity in the TVLES learning class and also found through observations about the monotonous way of teaching teachers such as by giving practice questions repeatedly so that students do not focus on learning in class.

One of the determining factors for the success of learning and education is the teacher factor. Therefore, teachers are required to plan and organize mathematics learning optimally. Good learning planning and implementation requires appropriate or innovative learning models. Many efforts have been developed in finding solutions to all problems in learning mathematics, namely through various application of learning models that involve students actively participating in each stage of learning. One of the learning models that actively involve students is using the cooperative learning model. The learning model is designed so that the conditions in which the success or failure of individual students are influenced by the success or failure of the group that he enters (Amri S, 2010). There are several types of cooperative learning models and one of them is the Student Teams Achievement Division (STAD) type. Through the application of the STAD type cooperative learning model, the teacher can create a learning atmosphere that can encourage collaboration between students in solving problems.

STAD type cooperative learning model is a type of cooperative learning model through the use of various small groups consisting of 4-5 students with different characteristics (Trianto, 2007). The phases of cooperative learning of the STAD type, Ibrahim (Trianto, 2007) are shown in Table 1. Gagne suggests that in every process there will always be someone's learning outcomes. Learning outcomes are often interpreted broadly to be used as various kinds of regulations for various things that students have achieved, for example assignments, daily tests, oral tests, homework given throughout the learning process and others (Tatipang R. D., 2009). Several studies that support the successful application of the STAD type cooperative learning model include those conducted by Lidya Karmila Berutu (Karmila, 2014) with the title Application of the STAD Type Cooperative Model to Improve Student Learning Outcomes in Two Variable Linear Equation System (TVLES) Materials for Class VIII SMPN 1 Satu Atap Sitingo Academic Year 2013/2014. The results of the study stated that the STAD type cooperative learning model was able to improve students' mathematics learning outcomes. Another study stated that through the STAD Type Cooperative Model was also carried out by Susianna Simbolon (Simbolon, 2015) who stated that the implementation of the STAD type cooperative learning model could trigger an increase in mathematics learning outcomes for students of SMK Negeri 1 Sitingo in class X TKR-3 on the topic of TVLES for the academic year. 2014/2015.

**Table 1:** Syntax and Teacher Activities in Cooperative Learning Type STAD

Phase	Teacher Activities
Phase 1: Delivering goals and motivating students	Deliver all the lesson objectives to be achieved in the lesson and motivate students to learn
Phase 2: Presenting/delivering information	Presenting information to students by demonstrating or through reading material
Phase 3: Organizing students in study groups	Explain to students how to form study groups and help each group make the transition efficiently
Phase 4: Guiding work and study groups	Guiding study groups as they work on their assignments
Phase 5: Evaluation	Evaluating learning outcomes about the material that has been taught or each group presenting their work
Phase 6: Giving awards	Look for ways to reward both individual and group effort and learning outcomes

(Trianto, 2007)

There are several advantages to the impact of implementing the STAD type of cooperative learning model, namely: (1) Helping students to gain more cross-racial friendships; (2) Train students in developing aspects of social skills in addition to cognitive skills; (3) In this model, students have two forms of learning responsibilities, namely learning for themselves and helping fellow group members to learn; (4) In this model, students teach each other to each other or peer-teaching is more effective than learning by the teacher; (5) Heterogeneous grouping of students makes the competition that occurs in the classroom more lively; (6) Good achievement and learning outcomes can be obtained by all group members; (7) Quizzes in the learning step make

students more motivated; (8) The quiz also increases individual responsibility because the final score of the group is influenced by the value of the quiz done individually; (9) There is an appreciation from the teacher, so that students are more motivated to be active in learning; (10) Group members with low achievement and learning outcomes have a big responsibility so that the scores obtained are not low so that the group scores are good.

Research on the STAD type cooperative model was also carried out by Nono Tunggono (Tunggono, 2013) which found that the effect of the implementation of STAD type cooperative learning on student learning outcomes in mathematics class VIII SMP 2 Negeri Krangkeng. In line with Kabita's research (Kabita, 2018) on the STAD type cooperative model, it is able to make mathematics learning outcomes increase with the target party being the students of SMPN 3 Karanganyar. Research using the STAD type cooperative learning model was also conducted by Wewe, M. (Wewe, 2014) with the results obtained that there was a significant positive effect on the learning outcomes of class VIII students at SMPN 7 Mataram. Research on the STAD type cooperative model was also carried out by Conscience (Nurani, 2020). The results showed that there was an effect on the achievement of students in Mathematics and Natural Sciences class 3 SMA Negeri 1 Weru 2019/2020 in mathematics. Research on the STAD model was also carried out by Giyanti (Giyanti, 2018) with the conclusion that the application of the STAD type cooperative learning model had a significant effect on student learning outcomes in mathematics. A similar study was also conducted by Rose Hakai, et al (Rose Hakai, 2019) who concluded that the application of the STAD model through an approach using Problem Solving made students' abilities increase in solving mathematical problems, especially in the TVLES topic.

In this study, the researcher tested the hypothesis with the formula: "the average student learning outcomes taught using the STAD type cooperative learning model are more than the student learning outcomes taught using conventional learning models on TVLES material". For this reason, researchers carry out learning mathematics, especially TVLES material using TVLES material learning tools that are arranged using the STAD type cooperative learning model and other devices that are arranged using a conventional model.

## 2. Research Procedure

The relevant research method to test the hypothesis is experimental research. However, considering that there are some conditions that cannot be controlled or some relevant variables that cannot be manipulated, the type of research used is quasi-experimental. This quasi-experiment was carried out in the even semester of the 2021/2022 academic year at SMP Negeri 1 Modoinding, which is located in the Modoinding sub-district, South Minahasa district, North Sulawesi province. The object of the research is the result of student learning about the TVLES material from the students of class VIII C and VIII D, totaling 21 students in each class. The treatment variables studied were the STAD cooperative learning model and the conventional model, and the response variable in this study was the student's learning outcomes about the TVLES material. The experimental conditions that

can be controlled are the students participating in the study, the learning time, the classroom atmosphere, the learning environment and the teacher who teaches. The condition of the experimental class is arranged in such a way that it meets the conditions of the Cooperative model as referred to in (Trianto, 2007). The students participating in the study in the treatment class and control class had the same characteristics. The learning time for the two classes is at almost the same hours with the same time allocation. The atmosphere and classroom environment for the two classes are relatively the same. Teachers who teach are researchers themselves.

The data used to test the hypothesis is data on student learning outcomes on the TVLES material, so the data comes from the students themselves. The data is a value in the form of a learning achievement score expressed by a number in the range of 0 to 100. The data is captured using the Learning Outcomes Test instrument which contains questions that are formulated in accordance with the learning objectives derived from the indicators of achievement of basic competencies in accordance with TVLES material. The instrument applied to the experimental class and the control class is the same instrument. The test is carried out after the learning for the TVLES material is completed. In order to test the hypothesis, the data were analyzed using a t-test regarding the average difference test of 2 groups (Lolombulan, 2017). Hypothesis testing is carried out after the prerequisite tests are carried out which include normality tests and homogeneity tests.

### 3. Results and Discussion

The data from this study were taken from two classes at SMP Negeri 1 Modinding in Class VIII C as the experimental class and class VIII D as the control class. There are 21 students in the experimental class and 21 in the control class. The data taken to test this hypothesis is student learning outcomes data obtained on the results of the pretest and posttest of a test conducted after learning the TVLES material. The statistical quantities of the experimental and control class data are described in Table 2 below:

**Table 2:** Differences in Pretest and Posttest Learning Outcomes of Experimental Class and Control Class Students

Statistics	Difference between Pretest-Posttest Experiment Class	Difference between Pretest-Posttest Control Class
Minimum Value	17	20
Maximum Value	89	68
n	21	21
Quantity ( $\Sigma$ )	1363	926
Mean ( $\bar{X}$ )	64,90	44,09
Variety ( $s^2$ )	384,1905	175,0905
Standard Deviation(s)	19,60078	13,23

In inferential analysis, hypothesis testing is carried out using a statistical t-test, which is preceded by prerequisite tests, namely normality tests and homogeneity tests of variance. The data used are the results of the final test in the experimental class and control class. Analysis of the final test results was carried out to determine the normality and

homogeneity of the data variance as a condition for conducting experiments on both classes.

Tests for normality and homogeneity of variance and hypothesis testing are presented as follows:

At the stage of the normality test results, the data obtained from the final test results with the Liliefors test which was completed using the help of Microsoft Office Excel software, the results were that in the experimental class,  $L_{count} = 0.16757 < 0.186 = L_{table}$  and in the control class  $L_{count} = 0,14846 < 0.186 = L_{table}$ . Because  $L_{count} < L_{table}$ , the final test results for the experimental class and control class are normally distributed.

The homogeneity of variance test was used to test the following hypotheses:

$$H_0: \sigma_1^2 = \sigma_2^2$$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

with the reject criteria  $H_0$  if the calculated F value ( $F_{count}$ ) is more than the  $F_{table}$  value or with the mathematical symbol,  $F_{count} > F_{table}$ .

The results of the homogeneity test analysis with the F test statistics on the final test result data, with  $S_{(1)}^2 = 100.929$  and  $S_{(2)}^2 = 70,833$  giving a value of  $F_{count} = 1.42 < 2.12 = F_{table}$  so accept  $H_0$ , for the calculation of the homogeneity test can be seen in Appendix 7. So, it can be considered that the variance of the two classes, namely the experimental class and the control class, is homogeneous. Based on normality and homogeneity testing, the data is normally distributed and has a homogeneous variance, so that hypothesis testing can be done with the following steps:

Furthermore, the research hypothesis was tested with the formula "the average student learning outcomes taught using the STAD type cooperative learning model are more than the student learning outcomes taught using conventional learning models on TVLES material". Hypothesis testing steps:

#### 1) Hypothesis

$$H_0: \mu_1 \leq \mu_2$$

$$H_1: \mu_1 > \mu_2$$

Information :

$\mu_1$ : the average student learning outcomes in classes that use the STAD-type cooperative learning model

$\mu_2$ : the average student learning outcomes in classes using conventional learning models.

a) Real level:  $\alpha = 0.05$

b) The test statistic used is the t statistic with both group data normally distributed. Calculation of statistical values is done by the formula:

$$t_{count} = \frac{\bar{X}_1 - \bar{X}_2}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where the constant s is calculated by the formula,

$$s = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

(Lolombulan, 2017)

c) Testing Criteria:

Reject  $H_0$  if  $t_{\text{count}} > t_{\text{table}}$

d) Count Statistics :

$$\bar{X}_1 = 64,90$$

$$S_1^2 = 384,1905$$

$$n_1 = 21$$

$$\bar{X}_2 = 44,09$$

$$S_2^2 = 175,0905$$

$$n_2 = 21$$

Based on the formulas above, it is obtained:

$$s = 16,72$$

and,

$$t_{\text{count}} = 4,03$$

In the t distribution table, the t value is obtained in the table cell ( $\alpha, n_1 + n_2 - 2$ ), yaitu :

$$t_{(0,05;40)} = 1,68$$

Because the value of  $t_{\text{count}} > t_{\text{table}}$ , the test decision is to reject  $H_0$ . The results of this statistical analysis mean that the average student learning outcomes taught using the STAD Cooperative learning model are more than the average student learning outcomes taught using conventional learning..

Based on observations made by researchers at SMP Negeri 1 Modinding, it can be seen that the effect of the STAD type cooperative learning model is able to improve student learning outcomes on TVLES material. The achievements of this study are in accordance with research conducted by researchers such as (Kabita, 2018), (Wewe, 2014), (Nurani, 2020), (Giyanti, 2018) and in particular (Rose Hakai, 2019). The last mention is due to Rose Hakai's research on the STAD type Cooperative model research to teach mathematics material, especially TVLES, although it is set with the Problem Solving model..

#### 4. Conclusions and Suggestions

Based on the research results obtained at SMP Negeri 1 Modinding, it can be concluded that there is a difference in the average learning outcomes of students using the STAD type cooperative learning model and student learning outcomes using conventional learning models on TVLES material. Student learning outcomes taught by the STAD type cooperative learning model are more than student learning outcomes taught using conventional learning models on TVLES material. In connection with the results of this study, it is necessary to suggest the following. For students to improve mathematics learning outcomes and motivate themselves to be more active and creative in learning mathematics even in the Covid-19 pandemic situation with STAD type cooperative learning. For teachers, it can be an alternative in the learning process by using the STAD type cooperative learning model to help students be more active and increase students' interest in learning in the learning process so as to create new and more efficient learning activities. For other researchers, it is hoped that they can carry out further research by choosing other mathematical materials, or applying other types of cooperative learning models.

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