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The Influence of Learning Cooperative Models *STAD (Student Teams Achievement Division)* on Student Cognitive Learning Outcomes

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Abstract

This study aims to analyze the effect of the cooperative learning model Student Teams Achievement Division (STAD) on students' cognitive learning outcomes in biology subjects. The research employed a quasi-experimental design with a post-test only control group approach. The sample consisted of two classes: an experimental class using the STAD model and a control class using the lecture method. The findings revealed that the average cognitive learning outcomes in the experimental class were higher (63.75) than in the control class (50.52). However, the t-test results showed no statistically significant difference ($p > 0.05$), indicating that the STAD model did not significantly impact students' cognitive learning outcomes in this context. Factors such as lesson planning, time constraints, and content mastery were the primary challenges in implementing the model. The study recommends improving the application of the STAD model to enhance its effectiveness in future implementations.

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1. INTRODUCTION

Education has an important role in producing an intelligent, creative and competitive generation. One indicator of the success of the educational process is the student's ability to achieve optimal learning outcomes, especially in the cognitive domain. The cognitive domain includes the ability to remember, understand, apply, analyze, evaluate and create, as explained in Bloom's taxonomy. Unfortunately, students' cognitive learning outcomes often do not meet expectations. One of the main causes is the use of traditional learning methods which do not involve students actively in the learning process.

Traditional learning methods, such as lectures, dominate the learning process in many schools. In this approach, the teacher tends to be the center of learning, while students only act as passive listeners. Research shows that this method is less effective in improving students' cognitive learning outcomes because it is unable to encourage their active involvement in the learning process (Nurmarita, 2023; Sopiah, 2021; Sukerti, 2020). In addition, monotonous learning makes students lose interest in learning, which ultimately has a negative impact on their motivation and learning outcomes (Ardianik & Sucipto, 2020; Muhlisin et al., 2021).

In contrast, cooperative learning models, such as *Student Teams Achievement Division* (STAD), have been proven to be an effective approach to improving student learning outcomes. The STAD model is designed to encourage students to work in small, heterogeneous groups. In this group, students support each other and are responsible for the success of individual and group learning (Yusri, 2023; Hanafi, 2024; Kristen & Airlanda, 2021). Research by Syamsu et al. (2019) and Somenada et al. (2022) shows that implementing the STAD model significantly improves student learning outcomes in various subjects, including science and mathematics.

The STAD model has five main components that make it effective, including 1) Class Presentation: The teacher provides a brief and concise explanation of the material. 2) Study Groups: Students are divided into heterogeneous groups to discuss and study together. 3) Individual Test: After the group discussion, students are given a test to measure individual understanding. 4) Individual Development Score: Each student gets a score based on improving their learning outcomes. 5) Group Awards: The group with the best achievement is given an award as motivation.

The STAD learning model is a learning model that can support the achievement of educational goals in Indonesia. However, in reality, learning at SMP Negeri 2 Wera still emphasizes the role of memory aspect alone, even though in the science learning process, especially biology, a learning model that is in accordance with the characteristics of the material that emphasizes the teaching and learning process is really needed. The application of learning models by teachers in biology learning is sometimes not optimal. This situation can be seen from Table 1 which presents data on the science learning outcomes of students in class VII of SMP Negeri 2 Wera.

Table 1. Results of MID Semester Scores for SMP Negeri 2 Wera.

No	Class	Student	Completed Students	Students do not complete	KK	MOH	Rate-rate
1	VII A	28	19	9	68	75	75,6
2	VII B	29	20	9	63	75	73,4
3	VII C	28	21	7	65	75	65,5
4	VII D	29	24	5	67	75	72

Source*: List of Biology Science Teacher Grades at SMP Negeri 2 Wera*

Based on Table 1.1 above, it shows that the learning outcomes achieved by students in learning science, especially biology, still have not reached the desired standard. This can be seen from the four classes, none of which achieved classical completeness, that is, the percentage was below 85%. This is caused by several things, including students' lack of attention to the lesson being delivered, students not paying attention to the teacher's explanation, lack of student participation, lack of interaction between students and teachers, and students with other students.

The description above explains that many students still experience learning difficulties in science subjects, especially in biology subjects. This is one of the main factors that hinders the achievement of minimum completeness criteria (KKM) so that teachers have difficulty explaining or presenting learning material and determining the appropriate model for the teaching and learning process in the classroom.

In the ongoing learning process, teachers predominantly use the lecture model and the learning model used is still not appropriate to the material being taught. This makes students less motivated during the learning process, young people get bored, sleepy, play with their friends and so on. In class they only take notes on what the teacher says, so the learning objectives they want to achieve are not in line with what is expected, this affects the students' social skills and cognitive learning outcomes. Facts found in the field that play a very important role in building a sense of togetherness also influence students' cognitive learning outcomes, including what often happens in schools, namely fights between students. This fight between students is caused by a lack of respect between students, this proves that students' social skills are still lacking.

Seeing this, one of the efforts made to overcome the above problem is by implementing the STAD (Student Teams Achievement Division) type cooperative learning model which can improve students' social skills. Considering the importance of social skills and cognitive learning outcomes, a solution is needed in the form of a more effective learning model, one of which is the Student Teams Achievement Division type cooperative learning model. This learning model can be used in all subjects and for all age levels of students. The Student Teams Achievement Division type cooperative learning model is a group learning system with the aim that students can work

together, be responsible, help each other solve problems, and encourage each other to achieve. The STAD type learning model also trains students to socialize well (Huda, 2013).

Research by Yusri (2023) shows that the STAD model has succeeded in improving students' biology learning outcomes in plant tissue material. Likewise, Ardianik and Sucipto (2020) reported that implementing this model increased students' activeness and mathematics learning outcomes. In addition, STAD not only has an impact on cognitive learning outcomes, but also strengthens students' social skills, such as the ability to work together, communicate, and be responsible for groups (Rahmat et al., 2022; Susila, 2022).

In the context of the Independent Curriculum, which is implemented in Indonesia, the STAD model is increasingly relevant. The Merdeka Curriculum encourages project-based learning and collaboration to build 21st century skills. The principles in the STAD model, such as cooperation, individual responsibility, and group respect, fit well with this approach (Zhang et al., 2022; Septaliza, 2023). Research by Rosfiani (2023) shows that the implementation of STAD in the Independent Curriculum not only improves student learning outcomes, but also encourages their active involvement in the learning process.

The STAD model also provides rewards as a motivational strategy. Group awards encourage students to contribute actively and feel responsible for the success of their group. Research shows that these awards significantly increase students' motivation to learn actively (Ritavany et al., 2022; Simaguna et al., 2020). Students are more motivated to discuss, share knowledge, and help friends in groups, which has a direct impact on their learning outcomes (Hewen et al., 2020).

However, although many studies demonstrate the effectiveness of the STAD model, some studies highlight that its implementation requires careful planning. Factors such as students' initial motivation, group dynamics, and the role of the teacher can influence the success of this model (Asmara et al., 2022; Muliati, 2023). In addition, further research is needed to explore how this model can be optimally applied in various educational contexts (Kristiani & Airlanda, 2021; Lestari, 2024).

Students' active involvement in the STAD model also contributes to the development of their critical thinking skills. Cooperative learning encourages students to discuss, analyze and solve problems together, which is an important element in critical thinking (Sulaksana et al., 2021; Ifa, 2023). In research by Dannggus (2020), the application of the STAD model in chemistry learning improved students' analytical abilities. Other research by Aziza (2023) shows that cooperative learning increases student activity, which ultimately results in better cognitive learning outcomes.

In order to improve overall student learning outcomes, it is important to integrate approaches such as STAD into everyday educational practice. This model not only contributes to improving cognitive learning outcomes, but also supports the development of students' social and critical thinking skills, which are very important in facing the challenges of the modern world. With this background, this research aims to analyze the effect of implementing the STAD type cooperative learning model on students' cognitive learning outcomes. It is hoped that this research can make a real contribution to the development of more effective, relevant and inclusive learning strategies in the future.

2. METHOD

The type of research used in this research is Quasi-experiment (quasi-experiment) because this research procedure is carried out to reveal causal relationships between intentional variables and other variables (Arikunto, 2010). The intentional (independent) variable in this research is learning *Student Teams Achievement Divisions* while the other variable (dependent) is students' cognitive learning outcomes.

Research Design

This research design uses 2 classes as samples, namely the control class and the experimental class. The design in this research uses *posttest only control group design.* The research design used by researchers is presented in the following table:

Table 2 Research Design *Posttest Only Control Group Design*

Class	Treatment	*Post test*
Experiment	X	THE_2
Control	AND	THE_4

(Sugiyono, 2014)

Information:
R = Experimental and control groups taken together *random*
X = learning with the STAD learning model
Y = learning with the conventional model
THE_2 = *Posttest* experimental class
THE_4 = *Posttest* control class

Based on the research design above, the control class is the class taken as a research sample which is taught using the lecture method, while the experimental class is the class taken as a research sample which is given treatment in the form of learning using the STAD learning model during the learning process. Final data was obtained from the grant *post-test* in both samples, both the control class and the experimental class.

Population and Sample

The population in this study were all class VII students at SMP Negeri 2 Wera, totaling 114 students divided into 4 classes, namely class VII A 28 students, class VII B 29 students, class VII C 28 students, class VII D 29 students. The samples in this research were class VII A and class VIIB which were determined using the Purposive Sampling technique. This is because the two classes have almost the same (homogeneous) learning outcomes. Class VIIA was used as the experimental class and class VII B as the control class.

Research Instrument

RPP Implementation Observation Sheet

Observation Sheet The implementation of learning is an instrument which is used to measure or obtain data on the implementation of learning or an activity designed by researchers and then observed in the learning process. The activities carried out are related to the implementation of the RPP, namely whether the implementation of learning is in accordance with the RPP (Learning Implementation Plan) or not. Observation results are recorded on a predetermined observation sheet, this is the teacher's activities from the beginning to the end of the lesson.

Cognitive Learning Outcome Test

Test sheets are used in this research to measure data regarding students' cognitive learning outcomes using learning models *Student Teams Achievement Division.* For the experimental class and lecture method for the control class. This test contains questions related to the material taught using the Natural Science Package Book for SMP/MTS Class VII Semester 2. Teo Sukoco, Rumiyati, Adip Ma'rifu Sururi. In this study, the number of questions consisting of 20 test items used was multiple choice taken from relevant references and taken from Biology textbooks and made based on the material with the aim of knowing students' achievements in mastering the material that has been taught. The questions were validated by two experts.

Data Collection Techniques

To collect data in this research, data collection was carried out based on techniques, namely tests are measuring tools given to individuals to get the expected answers either in writing or verbally or in action (Sudjana and Ibrahim, 2007. *Post-test* is a test that is used after a lesson has been completed. The goal is to find out how far the student has gone master or understand the material that has been taught.

Data Analysis Techniques

The data analysis techniques used are adjusted to the characteristics of the data.

RPP Implementation Data

Analysis of RPP implementation data as measured using observation sheets. Analyzed using the following formula:

$$\% \text{ Implementation of RPP} = \frac{\sum \ Implementation\ aspect}{\sum observed\ aspect} \text{ x } 100\%$$

Table 3 RPP Implementation Assessment Criteria

No	Percentage (%)	Category
1	80-100 %	Very good
2	60-79%	Good
3	40-59%	Pretty good
4	20-39%	Not good
5	0-19%	Not good

(Source: Sugiyono, 2013)

Cognitive Learning Results Test Data

Results data cognitive learning students are obtained through learning outcomes tests. Student learning outcome scores are calculated using the following formula:

$$\text{THAT} = \frac{The\ score\ obtained}{Maximum\ Score} \text{ x } 100$$

Normality Test

Before data on student learning outcomes obtained from the field is analyzed further, it is first tested for normality. The purpose of the normality test is to know if there is any data? *post-test* or the final ability of students in both classes comes from a normal population or not.

The normality test in this study uses a formula *Chi-square*

$$x^2 = \sum_{i=1}^{k} \frac{(f_o - f_h)^2}{f_h}$$

Information :

x^2 = Price *Chi-square*

f_0 : Frequency of observation data

f_h = Expected frequency

k = Number of interval classes

Normality tester with *Chi-square* has a test criterion, if$^2_{count} \leq \mathbf{x}^2_{table}$ at a significance level of 5%, the distribution of learning outcome value data (*posttest*) is stated to be normally distributed. Meanwhile, if $x^2_{count} \geq \mathbf{x}^2_{table}$ then it is declared not normally distributed.

Homogeneity Test

Homogeneity test to find out whether the two data used in this research are homogeneous or not homogeneous. Homogeneity testing uses the F-test with the following formula:

$$F = \frac{largest\ variance}{smallest\ variance} \text{ x } 100$$ (Sugiyono, 2014)

Hypothesis Test (t-test)

Hypothesis testing was carried out to determine the effect of providing learning model treatment *Student Teams Achievement Division* on students' cognitive learning outcomes.
If the variance is not homogeneous then the t-test formula used is separated variance with the following formula:

$$t_{count}= \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{s1^2}{n1}} + \sqrt{\frac{s2^2}{n2}}}$$

Information:
t : t test (t count)
$\underline{X}_1$: average value of the experimental class
$\underline{X}_2$: control class average value
S_1^2 : experimental class variations
S_2^2 : control class variance
n_1 : number of experimental class students
n_2 : number of control class students

1) If the variance is homogeneous then the formula is used *t-tes* the following:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Information:
$\underline{X}_1$: average value of the experimental class
$\underline{X}_2$: control class average value
S_1^2 : experimental class variations
S_2^2 : control class variance
n_1 : number of experimental class students
n_2 : number of control class students

Results

This research was carried out in July 2017 at class VII of SMPN 3 Mataram. Class VII A as an experimental class was attended by 28 students who were given treatment using the STAD type cooperative learning model *(Student Teams Achievement Division)* and class VII B as a control class was attended by 29 students who were given treatment using the lecture method.
RPP Implementation Data

Every learning activity is observed to observe the implementation of the learning implementation plan (RPP). Data on learning implementation in the experimental and control classes are presented in Table 4 below:

Table 4.1 Data on the Percentage of Implementation of the RPP at Each Meeting in the Experimental and Control Classes

No	Measurement Aspects	Experimental Class		Control Class	
		P I	Q II	P I	Q II
1	Total number of steps	12	12	7	7
2	The number of steps taken	12	12	6	5
3	Number of steps not executed	0	0	1	2
4	Percentage	100%	100%	85,7%	71,4%

5	Category	Very good	Very good	Good	Good

Based on table 4, it is known that the implementation of learning in the experimental class at meetings 1 and 2 was 100% in the very good category. Meanwhile, the percentage of learning implementation in the control class for meeting 1 was 85.7% with the Good category and meeting 2 was 71.4% with the Good category. This proves that learning in the experimental and control classes has gone well.

Data on Student Cognitive Learning Results

Learning outcome data is measured using 20 multiple choice questions and is given to students at the end of the lesson (*posttest*). As for data on class learning outcomes experiment and controls are presented in table 4.3 below.

Table 5 Data on Cognitive Learning Results of Experiment Class and Control Class Students

Class	Number of Students	The highest score	Lowest Value	Grade Average
Experiment	28	80	35	63,75
Control	29	65	30	50,52

Based on table 5, it can be seen that the data on students' cognitive learning outcomes above can be seen in the experimental class which received the highest score of 80, while the lowest score was 35 with an average of 63.75. Meanwhile, the control class obtained the highest score of 65 and the lowest score of 30 with an average of 50.52.

Question Validation Data

Question validation was carried out by two experts with an instrument in the form of a validation sheet. The results of the question validation are presented in the following table.

Table 6 Question Validation Result Data

Aspect	Validator rate I	Category	Validator rate II	Category
Head	3,5	Decent enough	4	Worth it
Language	2,6	Decent Enough	4	Worth it
Construct	3,05	Decent Enough	3	Worth it
Rate-Rata	3,05	Decent Enough	3,66	Worth it

Based on Table 6, it is known that the questions used in this research were categorized as appropriate based on the score obtained on a scale > 3.52, namely, for the first validator the total average reached 3.05 and for the second validator reached 3.66.

Hypothesis Testing

The data obtained through tests is then calculated and analyzed to determine the next steps in conducting research. Calculations and analysis carried out include normality tests, homogeneity tests, and hypothesis tests.

Normality Test

Normality test results for each group *Post-test* shown in table 7 as follows.

Table 7 Experimental Normality Test Results and Control Class

Variable	X^2_{count}	X^2_{table}	Normality Test
Posttest KE learning outcomes	12,208	14,06	Distributed Normal
Posttest KK learning outcomes			

Information: KE: Experimental Class and KK: Control Class

Based on the calculation results, it can be seen that X^2_{count} = 12.208 whereas X^2_{count} at a significance level of 5% with dk = 6 is obtained X^2_{table} =14.06 cos $X^2_{count} < X^2_{table}$, then results *posttest* experimental class is declared distribute normal.

Homogeneity Test

The homogeneity test aims to determine whether the experimental class and control class data come from the same sample (homogeneous). The data used to determine whether the two classes are homogeneous or not is taken from the final test results or *post-test* for each class. The results of calculating homogeneity test data can be seen from the following table:

Table 8 Post-test Homogeneity Test Results for Experimental and Control Classes

No	Class	∑Student	Average value	Variance (S^2)	F_{count}	F_{table}
1	Experiment	28	63,75	109729,6	1,53	1,93
2	Control	29	50,52	71455,76		

Information: KE: Experimental Class and KK: Control Class

Based on the homogeneity test in table 4.6, it can be seen that the variance in the experimental class is 109729.68 which shows the largest variance and the variance in the control class is 71455.76 which shows the smallest variance. Based on the calculation results, a significance level of 5% was obtained F_{count} = 1.53 and F_{table} = 1.93 or 1.53 < 1.93, then the two classes come from the same sample.

Uji-t

After carrying out the homogeneity test and normality test of the data, the data was declared homogeneous and distributed normal. So the next step is to test the hypothesis that was previously proposed using a formula *t-test polled Varians*. A summary of the results of hypothesis testing can be seen in Table 9 below:

Table 9 Summary of Hypothesis Test Results

Information	**Results**
The average value of the experimental class difference ($\underline{x}_1$)	63,75
The average value of the Control class difference ($\underline{x}_2^2$)	50,52
Experimental class deviation variance (S12)	109729,68
Control class deviation variance (S22)	71455,76
Number of Experiment class students (n1)	28
Number of Control class students (n2)	29
t_{count} (t-test)	1,53
t_{table} at the 5% significance level for dk = 55	1,93
Decision	H_{the} accepted and H_a rejected

Based on Table 9, it can be seen that the hypothesis proposed in this research has a value t_{count} bigger from t_{table} at the 5% significance level with dk = 55 ($t_{count} > t_{table}$ = 1.53>1.93). Thus, it can be concluded that Ho is accepted and Ha is rejected, meaning that there is no influence of the STAD type cooperative learning model *(Student Teams Achievement Division)* on students' social skills and cognitive learning outcomes.

3. DISCUSSION

STAD Type Cooperative learning model (*Student Teams Achievement Division)* is one of the cooperative learning models used in this research, and can provide a good understanding of the material. STAD combines the abilities of groups and quizzes with awards given to the group whose members are the most successful or most active in the class and each group presents the results of its discussion in front of the class (Dimyati and Modjiono, 1992). In this way, students can understand the subject matter and its application in everyday life.

Use of the STAD type cooperative learning model *(Student Teams Achievement Division)* in biology learning it can also be a form of students' social skills, namely a way for students to communicate with each other through interactions between peers which is usually given to bring about positive feedback from the ongoing learning process so that everything that is conveyed by the teacher is not only heard but can be understood, and The questions given by the teacher can be solved, apart from that, students can also increase interaction and cooperation with group friends, classmates and also teachers.

Based on the results of observations and observations made by observer during the learning process with the STAD Type Cooperative learning model *(Student Teams Achievement Division)* on the social skills of class VII students at SMPN 3 Mataram at the first meeting of experimental classes groups I, II, III, IV and V obtained total scores of 82%, 64%, 70%, 64% and 76% in the good category. The second meeting in the experimental class based on observations made by observers during the learning process obtained total scores in groups I, II, III, IV and V of 70%, 70%, 76%, 76% and 70% in the good category. Meanwhile, in the control class using the conventional learning model which was assessed in large groups (classes), the first meeting obtained a total score of 70% in the good category, while in the second meeting the students obtained 64% which was not good.

Based on data analysis of students' cognitive learning outcomes, it shows that the average score for the experimental class is higher than the control class with the average score for the experimental class being 63.75 in the quite good category and the control class getting an average score of 50.52 in the bad category. There are differences between the cognitive learning outcomes of experimental class students taught using the STAD learning model *(Student Teams Achievement Division)* and control classes taught using the learning model conventional This is caused by internal factors, namely the learning model applied.

This research besides using a learning model Cooperative Type STAD (*Student Teams Achievement Division)* in the learning process can cause reactions or interactions between students and teachers, or students with students in doing group tasks given by the teacher and working together in a group. Whereas in the control class that only uses the lecture or conventional learning model, where in the learning process the students only focus on the teacher's explanation which causes the student's interest in learning to be less, the interaction between the teacher and the student is also still less, the student tends to be weak and sleepy during the learning process. From the discussion above, it is very clear that the students' interest in learning in the experimental class by applying the learning model cooperative type STAD *(Student Teams Achievement Division)* is higher compared to the control class which only used lecture or conventional models. As Hamalik said in Hamdani (2011), learning media in the teaching and learning process can generate new desires and interests, generate motivation and stimulation of learning activities, and even have psychological influences on students.

Based on results analysis hypothesis testing *posttest* students' cognitive learning outcomes obtained grades $t_{count} < t_{table}$ or 1.53 < 1.93 means the STAD type cooperative learning model *(Student Teams Achievement Division)* doesn't have that effect significant on students' cognitive learning outcomes, this is due to researchers still not being able to make more mature learning plans, researchers also still not being able to control class conditions, and lack of time to carry out or apply the STAD type cooperative learning model *(Student Teams Achievement Division)* where this learning model requires more time to implement, in fact in the field The time available was very short so that a lot of material could not be delivered by the researchers so that many students

did not really understand the material being taught, apart from that the researchers were not able to master the material presented, and the learning model was not suitable for class VII students.

This is supported by research conducted by previous researchers Muhammad Sahdan Suandi, W. Lasmawan, Sariyasa (2013), The Influence of the STAD Type Cooperative Learning Model on Social Studies Learning Outcomes and Social Skills for Class V Students at SD Negeri 1 Jerowaru, East Lombok. The results of the research show that the learning outcomes of students who take part in learning using the STAD type cooperative model are better than students who were taught using the conventional learning model. In class V students at SD 1 Jerowaru, students who took part in learning using the STAD type cooperative learning model obtained the following data. Lots of data n = 30, average = 69, maximum score = 93, minimum score = 47, range = 46, variance = 103.77, and standard deviation = 9. From the score data on the learning outcomes of students who take part in learning with the approach conventionally obtained the following data. Lots of data n = 30, average = 10.07, maximum score = 17, minimum score = 2, range = 15, variance = 15.09, and standard deviation = 3.89. Based on the results of statistical calculations, it can be seen that the level results The learning of students who take part in learning using the STAD type cooperative model is mostly in the high and very high categories. This is better than students who follow conventional learning methods where the level of learning outcomes is mostly in the medium and low categories.

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