

Effect of the STAD Cooperative Learning Model on Collaboration Skills and Learning Outcomes of Class X Students at MA Miftahul Ulum Bettet Pamekasan

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Abstract

The issue faced at MA Miftahul Ulum Bettet Pamekasan is the low learning outcomes of students, which are attributed to a lack of interest and motivation to learn, minimal engagement in the learning process, and the absence of appropriate learning models that meet students' needs. Furthermore, interactions among students in the classroom tend to be individualistic, necessitating a learning model that can address these challenges, specifically the STAD (Student Teams-Achievement Divisions) cooperative learning model. This research aims to examine the effect of the STAD cooperative learning model on students' collaboration skills and learning outcomes. The research method is quantitative with a pre-experimental design, specifically a Posttest-Only Control Design. The sample selected consists of classes X IPA F and X IPA G, chosen through random sampling techniques. The results of the Mann-Whitney test indicate a significant difference in the mean collaboration scores, with a mean value of 3.00 (CI95=[1.0:5.0]). The applied learning model demonstrates a significant difference between the mean collaboration scores of the control and experimental classes ($U(48)=162$; $P=0.003$; $Rpb=0.483$). Similarly, concerning learning outcomes, there is a significant difference based on the mean score of 26 (CI95=[24.0:28.0]), indicating a significant difference between the means of the control and experimental classes ($U(48)=0.00$; $P=0.001$; $Rpb=1.00$). Based on these data, it can be concluded that the STAD cooperative learning model positively affects students' collaboration skills and learning outcomes.

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INTRODUCTION

Education is a fundamental process aimed at shaping students' character, deepening their understanding of religion, and developing individual potential regarding skills and intelligence to prepare for a better future. Through education, it is hoped that individuals can significantly contribute to themselves, society, the nation, and the state. To achieve these objectives, creating a pleasant learning atmosphere and process is essential, thereby increasing students' interest and enabling them to comprehend the material presented by educators. Education should be viewed as an effort to prepare students to face various challenges in daily life, equipping them with relevant knowledge and skills for future professions and positions (Maizarmis, 2019). The role of education in shaping and determining the quality of a nation is crucial. One of the determining factors of educational quality is the implementation of systematic learning and effective learning principles. Therefore, the government is responsible for addressing and enhancing the education system, ensuring quality, management efficiency, and educational standards in facing the challenges

of progress and the demands of increasingly complex life in this modern era. Education is an activity of transferring knowledge, skills, ethics, customs, traditions, and others, which are passed down from generation to generation through various forms of learning, training, and research conducted both inside and outside of school. The educational curriculum is continually updated to keep up with the development of the times and the increasingly dynamic needs (Setia & Yuspa, 2018).

In the current era, education is no longer solely oriented towards examination scores; it must also consider the mastery of various skills tailored to the demands of the 21st century. According to Reni et al. (2021), life in the 21st century requires individuals to master a range of skills, thus, education is expected to provide learning that facilitates the development of these skills to produce successful individuals. Doringin (2017) posits that 21st-century skills encompass the 4Cs: communication, collaboration, critical thinking and problem-solving, as well as creativity and innovation. The National Research Council Washington, DC (2013) emphasizes that, besides communication skills, students must be taught to collaborate with individuals from diverse cultural backgrounds and values. In seeking information and constructing meaning, students are encouraged to collaborate with peers in the classroom (Husain, 2019). Collaboration is a specific social interaction and learning process where group members are actively and constructively involved in problem-solving (Reigeluth et al., 2015). Another source explains that collaboration skills are the ability to work effectively together, demonstrate respect for diverse team members, and practice fluency and willingness in decision-making to achieve common goals (Greenstein, 2019). Therefore, collaboration skills are expected to optimize the learning process.

The low learning outcomes in the subject of Natural Sciences (IPA) indicate the need to implement varied learning approaches that align with the demands of 21st-century education (Meilani et al., 2020). Learning outcomes are the scores obtained after the teaching and learning process, where every effective learning activity can produce quality graduates (Ngailo et al., 2021). Learning outcomes also encompass changes in students' behaviour, including shifts in mindset, attitudes, values, and cognitive skills resulting from measurable and observable learning experiences. Achieving optimal learning outcomes can be realized if the teaching methods align with students' learning styles and consider the internal and external factors influencing learning engagement (Nur & Noviardila, 2021). A Program for International Student Assessment (PISA) survey indicates that from 2000 to 2018, Indonesia ranked low in education, with Indonesian students' PISA results in 2015 still below the average science scores among Organisation for Economic Cooperation and Development (OECD) countries. The average science score for the science literacy domain in OECD countries is 493, while Indonesia only achieved a score of 403 (Schleicher et al., 2018).

Based on observations conducted at MA Miftahul Ulum Bettet on December 13, 2021, interviews with the biology teacher, revealed that students' scores in this subject are relatively low. This is reflected in 75% of the total 35 students who have not reached the Minimum Completeness Criteria (KKM) of 70. Several issues identified as causes of low student learning outcomes include a lack of interest or motivation to learn, low engagement in the learning process, and insufficient application of appropriate learning models according to needs. In interviews with three students on the same date, it was expressed that the learning process tends to be teacher-centred and does not provide opportunities for students to develop knowledge and solve problems independently. Additionally, the tendency for students to work individually also poses a challenge to collaboration in the classroom. This can negatively impact the quality of learning outcomes, given that success in achieving subject

matter is highly dependent on the teacher's teaching methods. Therefore, teachers need to implement effective teaching strategies through suitable learning models.

Based on the analysis of the issues above, there is a need for a learning model that can enhance students' collaboration skills and learning outcomes. One relevant model for fostering collaboration skills, which is believed to address students' low learning outcomes, is the STAD cooperative learning model (Student Teams-Achievement Divisions). Research by Sefriani & Fitria (2015) indicates that the STAD cooperative learning model positively influences students' learning outcomes. This model involves grouping students into small groups of four to five members. In this model, students are taught to listen to others' ideas, express their ideas, provide suggestions, accept criticism, and engage in active discussions. The teacher's role in this model is as a facilitator who supports the learning process (Destrilia et al., 2021). According to Mudiono et al. (2018), STAD cooperative learning emphasizes student activity and interaction to motivate and assist one another in understanding the material to achieve optimal performance. Alfurqan (2022) adds that the STAD model encourages students to become accustomed to working collaboratively in teams and assisting each other in problem-solving. Roestiyah's opinion, as cited in Sudana & Wesnawa (2017), highlights the advantages of this model, including providing opportunities for students to ask questions, conduct in-depth investigations, develop discussion skills, and allow teachers to pay more attention to individual student's learning needs. Thus, implementing the STAD cooperative learning model is expected to improve biology learning outcomes, considering that learning outcomes result from a learning process involving students' behavioural engagement based on the experiences gained. This research aims to describe the effect of the STAD Cooperative Learning Model on Students' Collaboration Skills and Learning Outcomes in Class.

RESEARCH METHOD

Type and Design of Research

This quantitative study employs a pre-experimental design with a Posttest-Only Control Design, as illustrated in Table 1.

Table 1. Research Design

Group	Treatment	Posttest
Experiment	X1	O1
Control	X2	O2

Notes:

X1 : Implementation of learning using the STAD model

X2 : Implementation of learning without the STAD model

O1, O2 : Final test to assess students' understanding of ecosystem material after treatment

This research was conducted during the 2021/2022 academic year, with class X IPA F as the experimental group and class X IPA G as the control group. The research location is MA Miftahul Ulum Bettet, Pamekasan. The population for this study includes all students in class X at MA Miftahul Ulum Bettet, Pamekasan, during the second semester of the 2021/2022 academic year. The sample consists of 25 students from class X IPA F as the experimental group and 25 from class X IPA G as the control group. The sample selection was conducted using simple random sampling, which involved randomly selecting samples through a lottery from the three class X IPA sections available at MA Miftahul Ulum Bettet, Pamekasan. The variables in this study consist of two types: independent and dependent variables. The independent variable in this research is the

learning model (cooperative model of STAD and lecture method), while the dependent variables are students' collaboration skills and learning outcomes.

The learning devices designed and implemented in this study include a syllabus, Lesson Plan (RPP), Student Worksheets (LKS), assessment instruments, and observation sheets to implement STAD syntax. The Biology syllabus for the second semester of grade X is used, encompassing Basic Competencies (KD) 3.10 and 4.10, focusing on ecosystem material. The Lesson Plan (RPP) serves as a guide to ensure that the learning process proceeds smoothly and systematically, and it is structured following the syllabus covering the same KD 3.10 and 4.10. The Student Worksheets (LKS) applied in this study are designed according to the STAD cooperative learning approach, featuring articles and critical questions presented. The assessment instrument used in this research is a questionnaire that evaluates students' collaboration skills. At the same time, the observation sheet for the implementation of syntax is designed to assess the consistency of the learning process during the study based on the STAD cooperative syntax.

In this study, the instruments used to assess learning outcomes consist of a test with eight questions administered at the end of the treatment. The instrument trial was conducted at Madrasah Aliyah Miftahul Ulum Bettet Pamekasan, involving students from classes X F and X G, to evaluate the appropriateness and quality of the instrument's construction. The data collection process in this study is divided into two stages: preparation and implementation. The preparation stage includes various activities, such as school observations, obtaining research permits, preparing questionnaires, and creating rubrics for learning outcomes. Additionally, the preparation of learning devices includes the syllabus, Lesson Plan (RPP), Student Worksheets (LKS), and observation sheets to assess the implementation of STAD cooperative syntax. The implementation stage encompasses the following activities: first, conducting observations at Madrasah Aliyah Miftahul Ulum Bettet Pamekasan; second, executing the learning process according to the STAD-based RPP; and third, conducting posttests to evaluate students' learning outcomes.

The data analysis technique in this study is performed using Jamovi software version 2.0, which includes two main aspects: Assumption Testing and Hypothesis Testing. Assumption Testing consists of normality and homogeneity tests of the measurement data. Meanwhile, Hypothesis Testing is conducted by applying a test for the difference between two means, using parametric statistical techniques, namely the independent T-test, or non-parametric statistical techniques, such as the Mann-Whitney test. The hypotheses proposed in this study are: first, there is a significant effect of the STAD (Student Team Achievement Division) cooperative learning model on the collaboration skills of class X students at MA Miftahul Ulum Bettet; second, there is a significant effect of the STAD cooperative learning model on the learning outcomes of class X students at MA Miftahul Ulum Bettet.

RESULT AND DISCUSSION

Results and Analysis of Collaboration Skills Data

This section presents the results and analysis of collaboration skills data, highlighting students' ability to work together and communicate effectively, with the results as follows.

Descriptive Statistics

The mean collaboration scores for the control and experimental classes are presented in Table 2:

Table 2. Mean Collaboration Score Results

Group	N	Mean	Median	SD	SE
Experiment	25	27.3	27.0	4.16	0.832
Control	25	23.9	24.0	2.43	0.486

Table 2 shows that the mean collaboration score for the experimental class is 27.3, while the mean collaboration score for the control class is 23.9.

Assumption Testing

The normality assumption of the collaboration score data, which assesses whether the data distribution follows a normal pattern, is presented in Table 3.

Table 3. Normality Test Results for Collaboration Scores

Tests of Normality		Statistic	p
Collaboration Score	Shapiro-Wilk	0.982	0.620
	Kolmogorov-Smirnov	0.0754	0.939
	Anderson-Darling	0.216	0.836

Based on Table 3, the p-value is greater than 0.05, indicating that the collaboration scores are normally distributed. The assumption of homogeneity of variance for collaboration scores is presented in Table 4 as follows:

Table 4. Homogeneity Test Results for Collaboration Skills

		F	df	df2	P
Collaboration Score	Levene's	7.93	1	48	0.007
	Variance ratio	2.93	24	24	0.011

Based on Table 4, the p-value is less than 0.05, indicating that the variance of collaboration scores in both classes is not homogeneous.

Hypothesis Testing

Hypothesis testing was conducted using the non-parametric Mann-Whitney statistical technique, considering that the assumption of homogeneity of variance for collaboration scores was not met. The results of the hypothesis test are presented in Table 5:

Table 5. Mann-Whitney Hypothesis Test Results

Variable	Statistic	df	P	Mean difference	SE difference	Effect Size
Collaboration	Student's 3.53 a	48.0	<.001	3.40	0.964	Cohen's d 0.998
	Mann-Whitney U	162	0.003	3.00		Rank biserial correlation 0.483

Based on Table 5, the p-value is less than 0.05, indicating a significant difference in the mean collaboration scores between the control and experimental classes.

Results and Analysis of Learning Outcomes Data

Descriptive Statistics

The mean learning outcomes for the control and experimental classes are presented in Table 6:

Table 6. Mean Learning Outcomes

	Group	N	Mean	Median	SD	SE
Test Score	Experiment	25	52.4	54.0	4.39	0.877
	Control	25	26.4	26.0	3.92	0.783

Based on Table 6, the mean learning outcome (posttest) for the experimental class is 52.4, while for the control class, it is 26.4.

Assumption Testing

The normality assumption of the learning outcomes data is presented in Table 7:

Table 7. Normality Test Results for Learning Outcomes

	Variabel	Statistic	P
Test Score	Shapiro-Wilk	0.940	0.014
	Kolmogorov-Smirnov	0.171	0.106
	Anderson-Darling	1.34	0.002

Based on Table 7, the p-value is less than 0.05, indicating that the data are not normally distributed. The assumption of homogeneity of variance for learning outcomes is presented in Table 8:

Table 8. Homogeneity Test Results for Learning Outcomes

	Variable	F	df	df2	p
Test Score	Levene's	1.39	1	48	0.244
	Variance ratio	1.25	24	24	0.583

Based on Table 8, the p-value is greater than 0.05, indicating that the test scores have homogeneous variance.

Hypothesis Testing

Hypothesis testing was conducted using the non-parametric Mann-Whitney technique, and the results of the hypothesis test are presented in Table 9:

Table 9. Mann-Whitney Test Results for Learning Outcomes

Variable	Statistic	df	P	Mean difference	SE difference	Effect Size
Test Score	Student's t	22.1	48.0	< .001	26.0	1.18
	Mann-Whitney U	0.00	< .001	26.0		

Based on Table 9, the p-value is less than 0.05, indicating a significant difference in the mean test scores between the control and experimental classes with a large effect size. These results suggest a significant difference in learning outcomes between the two classes, indicating that the STAD learning model positively affects students' learning outcomes. This finding supports the effectiveness of collaborative learning strategies in enhancing students' academic performance.

Discussion

The Impact of the STAD Learning Model on Collaboration Skills

The results of this study indicate a significant effect of implementing the STAD (Student Teams-Achievement Divisions) cooperative learning model on enhancing students' collaboration skills. These findings align with the research conducted by Reni et al. (2021), which concluded that the application of the STAD cooperative learning model effectively improves collaboration skills among students. This is further supported by Setiawan (2022), who revealed that students' collaboration skills significantly increased when comparing pre- and post-implementation of the STAD method. According to Sulistiyawati (2020), the STAD model enhances collaboration skills by providing opportunities for students to assist one another in completing assigned tasks during the STAD steps. Additionally, students are encouraged to develop their argumentative skills through discussions, facilitating the exchange of ideas and productive cooperation.

This assertion is consistent with the research by Marheni et al. (2020), which emphasizes that in the learning process using the STAD model, students are focused on group learning activities, thereby training them to develop high social attitudes. The STAD cooperative learning model creates a comfortable learning environment where students can exchange opinions, collaborate in groups, and assist and encourage fellow group members to understand the subject matter. Lamba (2016) also noted that cooperative learning reduces students' hesitation in asking questions to peers who are perceived to understand the material being discussed better.

The Impact of the STAD Learning Model on Learning Outcomes

Statistical analysis results indicate that the STAD cooperative learning model positively affects students' learning outcomes in the ecosystem material. The analysis of the first hypothesis data indicates that implementing the STAD learning model results in higher learning outcomes than the control class, which utilized conventional methods. Previous research by Saadah & Susanti (2020) also demonstrated a significant difference in students' learning outcomes, evidenced by higher posttest scores in the experimental class compared to the control class. This finding is consistent with the research by Asmedy (2021), which affirms the positive impact of the STAD cooperative learning model on students' learning outcomes. The STAD model was implemented in the experimental class, while the control class employed a conventional or lecture-based approach. The STAD model has distinct advantages in enhancing students' learning outcomes, as it requires students to engage in group discussions, answer questions, draw conclusions, and receive rewards to motivate them to improve their learning outcomes.

The research shows that the STAD cooperative learning model demonstrates superiority over conventional learning models. This is attributed to the increased understanding of students, which is manifested through discussions with their groups and peers, as well as encouraging active participation in learning. Students become more confident in expressing their opinions and capable of explaining lesson issues through discussions and group work, and the application of the STAD model facilitates comprehension of the subject matter due to mutual assistance among students in groups, allowing them to more easily discover and understand challenging concepts (Suryanto, 2020). This finding is supported by Suryanto (2020), who states that improving students' learning outcomes reflects their social attitudes. Students exhibit responsibility towards their groups and peers, where those who have understood the material

feel a social obligation to assist their classmates who have not yet grasped the concepts in solving problems presented by the teacher.

CONCLUSION

The implementation of the STAD cooperative learning model has a significant impact on enhancing students' collaboration skills and learning outcomes. This model encourages students to assist one another and interact in group discussions and improves their understanding of the subject matter, particularly in ecosystem topics. Overall, the STAD learning model has proven effective in enhancing students' social and academic skills, which in turn contributes to better learning outcomes.

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