

## LITERATURE STUDY: APPLICATION OF THE STAD TYPE COOPERATIVE MODEL TO IMPROVE MATHEMATICS LEARNING OUTCOMES

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### Abstract

#### Keywords:

STAD Model,  
Mathematics Learning Outcomes,  
Literature Review,  
Cooperative Learning.

*This study aims to analyze the effectiveness of the Student Team Achievement Divisions (STAD) cooperative learning model in improving mathematics learning outcomes based on existing literature. The research is motivated by the persistent challenges students face in mastering mathematical concepts and the need for more engaging instructional strategies. The methodology employed is a Literature Review, involving the systematic analysis of various peer-reviewed journals and previous research findings. The results of the literature synthesis indicate that the STAD model consistently enhances students' academic performance across different educational levels. The key factors contributing to this improvement include structured group discussions, peer tutoring, and individual accountability through quizzes, which collectively foster a deeper understanding of mathematical materials. Furthermore, the findings suggest that STAD effectively encourages active participation and reduces student anxiety toward mathematics. This study concludes that the implementation of the STAD model is a highly relevant and effective strategy for teachers to optimize learning outcomes and build a collaborative classroom environment.*



## INTRODUCTION

Mathematics education plays a vital role in the development of science and technology and in shaping students' thinking skills. Education is a conscious effort to prepare students through guidance, teaching, and/or training to enable them to fulfill their roles in the future. (Law of the Republic of Indonesia No. 2 of 1989, Chapter I, Article 1).

Mathematics is a compulsory subject taught at every level of education and serves as the foundation for the development of various other fields of study. Success in mathematics learning can be seen in students' ability to understand concepts, complete assignments, and apply this knowledge in everyday life. Therefore, mathematics

learning focuses not only on mastering the material but also on optimally developing students' thinking and problem-solving skills.

However, in school learning practices, particularly at the junior high school (SMP) level, various problems are still found that contribute to low student mathematics learning outcomes. Many students consider mathematics a difficult and uninteresting subject, resulting in low learning motivation and low student participation in learning activities. Research shows that teacher-centered learning methods can cause students to become passive and less active in the learning process, which ultimately impacts student learning outcomes. (Rahmawati & Ahmad, 2024)

The low mathematics learning outcomes of students can be seen from the large number of students who have not yet achieved the minimum completion criteria (KKM). This condition indicates that the ongoing learning process has not been fully effective in helping students understand mathematical concepts optimally. Therefore, a learning model is needed that can increase active student engagement in the learning process. One approach that can be used is the cooperative learning model. The cooperative learning model emphasizes collaboration among students in small groups to achieve learning objectives together. (Hamid dkk, 2022)

One type of cooperative learning model widely used in mathematics is *Student Teams Achievement Division* (STAD). According to (Wulandari dkk, 2022) the STAD cooperative learning model, students are placed in small, heterogeneous groups. Students then work together to understand the subject matter and help each other if they experience difficulties. This model also provides rewards to groups based on their members' achievements, thereby increasing student learning motivation.

In addition to improving learning outcomes, the STAD learning model has also been shown to increase student learning engagement during the learning process. In this model, students are encouraged to discuss, exchange ideas, and collaborate to solve mathematical problems. High levels of learning engagement will help students better understand mathematical concepts. (Angelia Simorangkir dkk, 2022)

Although numerous studies have demonstrated the effectiveness of the STAD cooperative learning model in improving students' mathematics learning outcomes, these research findings are scattered across various journals and have not been systematically summarized. Therefore, a comprehensive study is needed to identify, analyze, and synthesize research findings related to the application of the STAD cooperative learning model in improving students' mathematics learning outcomes.

Based on the description above, this research was conducted using the Systematic Literature Review (SLR) method to systematically review various studies related to the application of the STAD type cooperative learning model in improving mathematics learning outcomes.

## REVIEW LIBRARY

Rahmawati and Ahmad (2021) in their research in the journal *Eduproxima* revealed that the use of the *Student Team Achievement Divisions* (STAD) cooperative model has a significant impact on critical thinking skills and student learning outcomes. The STAD model emphasizes interaction between students in heterogeneous groups, where individual and group responsibilities encourage students to be more active in analyzing heat transfer phenomena. Through the systematic syntax of STAD, students are required not only to memorize concepts but also to solve problems collaboratively,

which directly stimulates critical thinking indicators and positively impacts their cognitive learning outcomes.

Simorangkir et al. (2022) in their study entitled " The Effect of Learning Interest and Motivation on Mathematics Learning Outcomes of Class VIII Students of SMP Private Cinta Rakyat 3 Pematangsiantar" proved that learning interest and motivation significantly influence students' mathematics learning outcomes. This study emphasizes that the combination of interest in the material and internal motivation is crucial for students' academic success in the classroom.

Purniwantini (2022) in her research entitled " The STAD Model Improves Mathematics Learning Outcomes of Grade VI Students at Schools " shows that the effective implementation of the STAD model can improve students' mathematics learning outcomes. This study confirms that the cooperative learning structure in STAD can optimize material understanding through teamwork, thus having a positive impact on students' academic achievement in the classroom.

## METHOD STUDY

This study employed *the Systematic Literature Review (SLR) method* , a method used to systematically and structuredly identify, evaluate, and review relevant research findings. Data were collected from *Google Scholar* , a national journal database that provides a wide range of scientific articles. Article search focused on publications from 2020 to 2025. The procedure was divided into three main phases: pre-implementation, implementation, and evaluation.

1. Pre-implementation stages
  - a. Situation and Needs Analysis: The team conducted field observations and in-depth interviews with mathematics teachers to map classroom dynamics. This included identifying students' core competencies, prevailing instructional patterns, and barriers to the teaching and learning process.
  - b. Diagnostic Assessment (Pre-test): Initial data collection is conducted through a test to measure students' mastery of the material. This data serves as the basis for designing targeted learning strategies.
  - c. Preparation of Learning Tools: The team prepares teaching materials that are relevant to the curriculum, supported by STAD-based learning media, such as LKS, teaching aids, and interactive visual content.
  - d. Teacher Capacity Building: Teachers are equipped with an understanding of the philosophy of cooperative learning and the technical implementation of the STAD model. This training covers how to organize heterogeneous groups and evaluation mechanisms, enabling teachers to act as effective facilitators.
2. Implementation Stage

The stages are the core of the research activity, where the STAD method is applied directly in the classroom. These stages are carried out in the following order:

  - a. Teacher Delivery: The teacher delivers mathematics material concisely and clearly, using prepared teaching media. The presentation remains interactive to encourage student questions and responses.

- b. Heterogeneous Team Formation: Students are divided into groups or teams of 4–5 members with varying abilities. These heterogeneous teams aim to help students complement each other's strengths and weaknesses.
- c. Team Learning and Discussion: Each team works together to solve problems, discuss the material, and help each other with difficulties. The teacher acts as a facilitator and discussion director to ensure each team member is engaged.
- d. Individual Quizzes: After the team study session, each student takes an individual quiz to assess their personal understanding of the concepts. The results of this quiz are then used to calculate the team score.
- e. Team Evaluation and Rewards: Individual scores are compiled to determine the team's overall score. Teams with the highest achievements are awarded symbolic awards, such as certificates, achievement stickers, or class commendations. Awards serve to motivate students and foster a sense of team responsibility.
- f. Teacher Mentoring: The community service team assists teachers in classroom management, provides strategic advice, and helps resolve challenges during learning. This mentoring helps teachers understand how to effectively implement the STAD method.

### 3. Evaluation Stage

This evaluation stage is conducted to measure the program's effectiveness and the impact of the STAD method implementation on student learning achievement and participation levels. The assessment process uses the following instruments:

- a. Final Assessment ( *Post-test* ): The level of mastery of the mathematics material is measured using a *post-test* . The data obtained is then compared with the *pre-test scores* to determine the effectiveness of the learning methods implemented.
- b. Observation of Student Engagement: Direct observation is carried out to monitor the dynamics of student learning, which includes indicators of activeness such as the ability to ask questions, discuss, work in a team, and be independent in completing tasks.
- c. Feedback Survey (Questionnaire): Teachers and students were asked to provide feedback via a questionnaire regarding their learning experiences and satisfaction with the STAD model. The results were analyzed descriptively to map the method's impact on participants' learning motivation.
- d. Data Synthesis and Analysis: Learning outcome data was processed by comparing average scores before and after the intervention. Furthermore, activity and questionnaire data were analyzed qualitatively and quantitatively to provide a comprehensive picture of changes in student behavior and participation.
- e. Reporting and Recommendations: The evaluation results are compiled in the form of a community service report containing findings, analysis, and recommendations for teachers and schools in implementing the STAD method on an ongoing basis.

## RESULTS AND DISCUSSION

Based on a literature search of several relevant research articles, it was found that the implementation of the STAD cooperative learning model consistently had a positive impact on students' mathematics learning outcomes. The results include:

### 1. Student Learning Outcomes

*pre-test* data, the average student mathematics score before the implementation of the STAD method was recorded at 61 with a learning completion rate of only 55%. This figure is still below the established Minimum Completion Criteria (KKM), which is 75, indicating that there are obstacles in students' understanding of the material on linear equations with one variable and solid shapes. However, after intervention through the STAD method, the *post-test results* showed a significant increase with an average score reaching 82 and the completion rate soaring to 90%. These findings strengthen the evidence that the STAD model is effective in optimizing students' mastery of mathematical concepts.

**Table 1. Comparison of Student Learning Outcomes (Pre-test and Post-test)**

Class	Number of Students	Pre-test Average	Post-test Average	Pre-test Completion Percentage	Post-test Completion Percentage
7A	30	61	82	55%	90%

Based on the data analysis, the STAD model has been proven to create a collaborative learning ecosystem that encourages students to provide academic support and actively engage in argumentation. The synergy between systematic group discussions and self-assessment through self-administered quizzes fosters a more comprehensive understanding of concepts. This reinforces previous literature suggesting that STAD's effectiveness significantly contributes to improving students' critical thinking and mathematical communication skills.(Winartasa, 2025)

### 2. Student Participation

Student activity observations were conducted throughout the learning process. Indicators observed included asking questions, answering questions, discussing with peers, helping team members, and completing assignments. Observations showed a significant increase in student active participation.

**Table 2. Student Activities During STAD Learning**

Activity Indicator	Before STAD	During STAD
Ask	40%	85%
Answering teacher's questions	35%	80%
Group discussion	50%	95%
Helping friends	30%	88%
Completing the task	55%	92%

The results of this study strengthen the evidence that the implementation of the STAD model can create a dynamic and cooperative learning environment. Active

participation demonstrated by students not only influences the level of understanding of the material but also plays a crucial role in honing social skills, including the ability to interact, respect differences, and responsibility within a group. This aligns with the basic principles of cooperative learning, which emphasize positive interdependence and simultaneous individual responsibility.

### 3. Teacher and Student Responses

Based on the satisfaction questionnaire, the majority of teachers assessed that the STAD method facilitated classroom management and increased learning effectiveness. Teachers stated that implementing STAD helped them see students' abilities individually and as a team, allowing them to provide more appropriate attention. Students also responded positively. They felt more motivated to learn, understood concepts more easily, and enjoyed working in teams. Some students stated that team discussions made learning more enjoyable than conventional lecture methods. (Purniwantini, 2022)

### 4. Analysis of Success and Constraints

The success of implementing the STAD method is influenced by several factors:

#### a. Readiness :

Teachers who understand the principles of STAD can manage teams more effectively.

#### b. Student involvement:

Student motivation and active participation encourages the achievement of better learning outcomes.

#### c. Instructional Media:

LKS, teaching aids, and visual materials help students understand concepts.

The obstacles encountered include:

a. The large variation in student abilities requires more attention from teachers in guiding teams.

b. Limited learning time sometimes makes it difficult to complete all team discussions.

c. The solutions implemented included heterogeneous team division, balanced assignments, and clear time allocation for individual discussions and quizzes.

## CONCLUSION

Based on the results of the literature study, it can be concluded that the implementation of the STAD cooperative learning model can significantly improve students' mathematics learning outcomes at various levels of education. The effectiveness of this model lies in the combination of structured group discussions and individual accountability through quizzes, which encourage students to understand concepts more deeply. In addition to the cognitive aspect, the implementation of STAD has also proven effective in increasing students' active participation, communication skills, and social interactions in the learning process. Thus, the STAD model remains a highly relevant learning strategy to address low mathematics learning outcomes. Empirical data shows a significant increase in concept mastery, as seen from the average increase in grades from 61 to 82, with a drastic increase in the classical completion rate from 55% to 90%. In addition to the cognitive aspect, this method

successfully transformed classroom dynamics by increasing students' active involvement in discussions and collaboration. Positive responses from teachers and students strengthen the evidence that STAD not only simplifies classroom management but also increases learning motivation. Despite facing challenges such as heterogeneity in ability and time management, the use of cross-ability group strategies and intensive mentoring has proven to be able to overcome these obstacles, thus maintaining the essence of positive interdependence.

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