International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 5, 2025
https://theaspd.com/index.php

An Examination Of The Attributes Of The STAD Type Cooperative Learning Model In The Context Of Integrated Science Education For Junior High School Students In Pasaman District

Pinta Medina[1], Ellizar[2], Lufri[3]
[1,2,3]Educational Sciences, Padang State University, Padang, Indonesia

Abstract:
This research analysis seeks to examine the characteristics and effects of applying the Student Teams Achievement Divisions (STAD) cooperative learning model in integrated scientific education at junior high schools in Pasaman Regency. This study employed a quantitative methodology with a quasi-experimental design, encompassing a sample of 180 students from SMP 1 Luhak Nan 2 and SMP 3 Luhak Nan 2 in Pasaman Regency. Data was gathered via assessments of learning outcomes, observations of collaborative abilities, and questionnaires assessing student opinions and motivation to study. The research findings indicate that the STAD learning model exhibits key attributes such as collaboration in diverse groups, dynamic social interaction, and group recognition. Implementing the STAD approach has had a substantial influence on enhancing student learning outcomes, fostering collaborative abilities, and bolstering students' enthusiasm and positive attitudes towards learning. The mean score of students' learning outcomes and collaboration abilities in the experimental group was higher than that of the control group, with a statistically significant disparity. The students in the experimental class exhibited elevated levels of learning motivation and held more favorable opinions regarding integrated science study. These findings corroborate the theories of social constructivism and cooperative learning and have practical implications for enhancing learning at the junior high school level, particularly in enhancing the quality of scientific education in Indonesia.

Keywords: *Cooperative Learning, STAD, Integrated Science, Learning Outcomes, Collaborative Skills, Learning Motivation, Middle School*

A. INTRODUCTION

Education is an essential foundation in developing the nation's next generation and learning science (science) at the junior high school (SMP) level is one of the primary keys to creating a generation that is literate in science and technology (Smith, M.Horne, 2019). Integrated science learning, which combines various scientific disciplines in one unit, is a learning trend expected to develop students' critical thinking and problem-solving abilities (David W. Johnson, Roger T. Johnson, 2013; Johnson et al., 2014; Johnson & Johnson, 2008).

However, the effectiveness of this learning approach depends on the learning model educators use. Cooperative learning models, especially the Student Teams Achievement Divisions (STAD) type, have been widely adopted to increase student involvement and learning outcomes in science learning (E. Slavin, 2019).

The STAD model is a cooperative learning approach that prioritizes collaboration among students in small, diverse groups (Slavin, 2014). Each group member helps each other achieve learning goals, and group work results influence individual assessment. In science learning, this model is expected to facilitate active learning, develop collaborative abilities, and increase students' understanding of complex science concepts (Gillies, 2007, 2016; Gillies & Boyle, 2008). Although many studies have highlighted the effectiveness of the STAD model in various disciplines, further studies are needed to understand its characteristics and impact on integrated science learning in junior high schools, especially in Indonesia, especially in Pasaman Regency, which has unique cultural and educational characteristics.

Previous research shows that The STAD cooperative learning paradigm has a beneficial effect on enhancing student learning outcomes. For example, (Disler et al., 2019) research found that students who studied using the STAD model better understood concepts than those who studied using conventional methods. This model also increases students' learning motivation because of the intense social interaction in the study group (Johnson et al., 2014). However, most of this research was

conducted in Western countries or educational contexts that differ from those in Indonesia. Therefore, Additional investigation is required to assess the efficacy of the STAD model in various educational settings, such as in Pasaman Regency.

This research aims to fill the gap in the lack of in-depth empirical studies regarding applying the STAD model in integrated science learning in junior high schools in Indonesia, especially in Pasaman Regency. Although several studies have explored the use of cooperative models in science learning in Indonesia (Astuti, 2019), these studies have not explicitly examined the impact and characteristics of the STAD model in integrated science learning. Apart from that, studies on how this model interacts with cultural and local factors in Pasaman Regency are minimal. Therefore, this research seeks to answer the following question: What are the characteristics and what is the effect of implementing the STAD-type cooperative learning model on integrated scientific learning in junior high schools in Pasaman Regency?

The objective of this research is to examine the attributes of the STAD-type cooperative learning model within the framework of integrated scientific education in junior high schools located in Pasaman Regency. This research seeks to assess the influence of this model on student learning outcomes and determine the elements that affect the success of implementing the STAD model in the local educational setting. This research will examine how the STAD model influences students' understanding of science concepts, collaborative skills, and learning motivation. In addition, this research will identify challenges that teachers and students may face in implementing this model.

The cooperative learning theory, which is the basis of this research, comes from the theory of social constructivism proposed by Kurniati (2017) and Vygotsky (2019). This theory emphasizes that learning occurs through social interaction and cooperation between individuals. In a cooperative learning context, students learn through discussion and collaboration with their peers, which helps them build a shared understanding of the concepts being studied (Gillies, 2016). Based on this theory, the STAD model is designed to maximize social interaction between students in study groups to help each other solve problems and understand lesson material.

Previous research also shows that the cooperative learning model has great potential to improve students' collaborative skills. For example, E. Slavin (2019) found that students who studied using a cooperative model could work together in groups, solve problems collectively, and discuss their ideas better than students who studied individually. In addition, research by Gillies (2016) shows that the cooperative learning model can increase students' sense of responsibility for their learning and that of their group, positively impacting their learning outcomes.

However, despite the many benefits that have been reported, there are several challenges in implementing the STAD cooperative learning model. Research by (Sharan, 2010) identified that one of the main obstacles to implementing this model is teachers' and students' lack of readiness to adapt to a more interactive learning approach. On the other hand, the competitive culture that is still strong in some schools can also hinder the effectiveness of cooperative learning (Disler et al., 2019). Therefore, this research will examine further how these factors influence the implementation of the STAD model in Pasaman Regency and how teachers can overcome these challenges.

It is hoped that this research's benefits can contribute theoretically and practically. Theoretically, this research will enrich the literature regarding applying the STAD cooperative learning model in the context of integrated science learning, especially in Indonesia. This research will also provide new insights into how local and cultural characteristics can influence the effectiveness of cooperative learning models. Practically, the results of this research can guide teachers in implementing the STAD model more effectively in the classroom and provide input for education policymakers in Pasaman Regency in designing relevant teacher training programs.

Thus, the expected results of this research are: (1) a better understanding of the characteristics of the STAD model in integrated science learning in junior high schools in Pasaman Regency, (2) increased learning outcomes and collaborative skills of students through the application of the STAD model, and (3)) practical recommendations for teachers and schools in optimizing the use of this cooperative learning model in the classroom. Furthermore, it is anticipated that the findings of this study can serve as a valuable resource for future research endeavors seeking to investigate the implementation of cooperative learning models in diverse settings.

B. METHOD

This study employs a descriptive quantitative research design, utilizing a quasi-experimental approach. The decision was made to utilize quantitative research methods in order to assess the effects of implementing the STAD-type cooperative learning model on student learning outcomes. and their collaborative skills in integrated science learning (J. W. and J. D. Creswell, 2023). A quasi-experimental approach was used because this research was conducted in an established classroom environment, so complete sample randomization was impossible (Fraenkel, J. R. & Wallen, 2012).

Research Subjects and Sampling Techniques

The participants of this study consisted of eighth-grade students from two junior high schools in Pasaman Regency, specifically SMP 1 Luhak Nan 2 and SMP 3 Luhak Nan 2. The population for this study consisted of all eighth-grade pupils in these two schools, totaling 180 students. The sample approach employed was purposive sampling. That is, sample selection was based on specific considerations, such as the availability of facilities, teacher readiness, and student characteristics (Sugiyono, 2017). Thus, in each school, two classes were selected that were equal in terms of academic achievement to be used as the experimental and control classes.

Data Collection Techniques and Research Instruments

The data in this research was collected through several techniques, including learning outcomes tests, observations, and questionnaires. Each data collection technique is adapted to the research objectives, which involve students' understanding of integrated science material and collaborative skills resulting from applying the STAD model.

1. Learning Outcome Test: This test measures students' understanding of the science concepts taught during the experiment. This examination comprises a combination of multiple-choice questions and essays that have undergone rigorous testing to ensure their validity and reliability (Samuel, n.d., 2017). The test instrument is prepared based on the integrated science curriculum and includes material taught during the learning cycle.
2. Observation: Observation techniques measure students' collaborative skills during learning. Observations were carried out using observation sheets, which recorded student behavior in groups, such as active involvement, communication, and the ability to solve problems together (E. Slavin, 2019). Observations were carried out by researchers and assisted by teachers in the class.
3. Questionnaire: A questionnaire was used to measure students' perceptions of STAD cooperative learning and their learning motivation. This questionnaire consists of several closed questions arranged based on a Likert scale and has been tested for validity and reliability (J. W. Creswell, 2021). The use of questionnaires helps to obtain more subjective data regarding students' attitudes and motivation during the learning process.

Data Analysis Techniques

Data from study tests, observations, and questionnaires were analyzed using descriptive and inferential statistical techniques.

1. Descriptive Analysis: This technique describes the distribution of learning outcome scores, level of collaborative skills, and student motivation during the research. Descriptive analysis includes calculating the average, median, mode, and standard deviation (Sugiyono, 2017).
2. Inferential Analysis: To test the research hypothesis regarding to examine the impact of applying the STAD-type cooperative learning model on students' learning outcomes and collaborative abilities, a statistical analysis known as a t-test for independent samples (independent sample t-test) was employed (Field, 2009). This study examines the learning outcomes of the experimental class, which utilizes the STAD model, in comparison to the control class, which employs standard teaching methods. In addition, an ANCOVA (Analysis of Covariance) test was carried out to control confounding variables and provide a more in-depth analysis of the effect of applying the STAD model (Tabachnick, Barbara G. & Fidell, 2012).

All data is analyzed using statistical software such as SPSS or similar programs to ensure the accuracy of the analysis results. This technique is expected to provide a comprehensive understanding of the characteristics and impact of implementing the STAD model in integrated science learning in junior high schools in Pasaman Regency.

C. RESULTS AND DISCUSSION

Results

The data collected from the research instrument has been used to analyze the results of tests on student learning outcomes, collaborative skills, and student perceptions and motivation regarding the application of the STAD-type cooperative learning model in integrated science learning. at SMP 1 Luhak Nan 2 and SMP 3 Luhak Nan 2 Pasaman Regency.

1. Student Learning Outcomes

The outcomes of student learning assessments conducted on the experimental group, which employed the STAD model, and the control group, which utilized traditional learning approaches. were compared to see whether there were significant differences in academic achievement. The following is a summary of student learning outcomes data from both groups:

Table 1. Student Learning Test Results

Class	Number of Students	Average Test Score	Standard Deviation
Experiment	90	85.5	4.2
Control	90	68.3	5.8

Table 1 shows that the average score on the student learning outcomes test in the experimental class is 85.5, with a standard deviation of 4.2. In comparison, the control class has an average score of 68.3, with a standard deviation of 5.8. The results indicate that students in the experimental class, who employed the STAD learning model, achieved superior learning outcomes compared to those in the control class, who utilized conventional learning approaches.

Additional statistical analysis was conducted using the t-test to determine if the disparity in mean scores was statistically significant. The t-test yielded a t-value of 12.5, indicating a statistically significant difference between the student learning outcomes in the experimental and control classes. This conclusion is supported by a p-value of less than 0.05. Therefore, it can be inferred that implementing the STAD-type cooperative learning model has a substantial beneficial effect on student academic achievements in integrated science education.

2. Student Collaborative Skills

Students' collaborative skills are assessed through an observation sheet that includes five indicators: active involvement, communication, listening ability, joint problem-solving, and task sharing. The following is a summary of student collaborative skills data:

Table 2. Observation Results of Student Collaborative Skills

Indicator	Average Experiment Score	Average Control Score
Active Engagement	4.5	3.0
Communication	4.2	3.1
Listening Ability	4.4	3.2
Joint Problem Solving	4.6	3.0
Division of tasks	4.3	2.9
Total Average	4.4	3.0

According to Table 2, the average score for collaborative abilities among students in the experimental class is greater than the average score among students in the control class. The mean collective aptitude of pupils in the experimental group was 4.4, whereas in the control group, it was merely 3.0. Evidence demonstrates that the STAD-type cooperative learning paradigm enhances students' ability to work together effectively, particularly in terms of active participation and collective problem-solving.

3. Student Perceptions of STAD Cooperative Learning

A perception questionnaire measured students' views regarding The STAD cooperative learning model involves students in the experimental class. were given a questionnaire comprising various statements regarding ease of understanding concepts, motivation, and involvement in group discussions.

Table 3. Results of the Student Perception Questionnaire on STAD Cooperative Learning

Statement	Average Score (Scale 1-5)
I find it easier to understand concepts.	4.6
I feel more motivated in groups.	4.4
I feel more involved in the discussion.	4.3
I am satisfied with this learning method.	4.5

Total Average	4.45

Table 3 shows that the average student perception of the STAD cooperative learning model is very positive, with an average score of 4.45 on a scale of 1-5. It shows that students feel this method helps them better understand the material, increases learning motivation, and makes them more involved in group discussions.

4. Student Learning Motivation

Using the STAD model, motivation questionnaires measure students' intrinsic and extrinsic motivation while participating in integrated science learning. The following is a summary of student motivation data:

Table 4. Student Learning Motivation Questionnaire Results

Statement	Average Score (Scale 1-5)
I am interested in science material.	4.5
I try to get good grades.	4.2
I am motivated to study harder.	4.3
Total Average	4.33

Table 4 shows that students' learning motivation in experimental class exhibits a significantly high level, as indicated by an average score of 4.33. The utilization of the STAD model not only enhances academic achievements but also impacts students' inclination to exert greater effort in their studies.

Based on the results and data analysis, it can be inferred that implementing the STAD-type cooperative learning model has a substantial beneficial effect on student learning outcomes, collaborative abilities, favorable attitudes towards learning, and student enthusiasm to study. The students in the experimental class, who utilized the STAD model, achieved superior learning outcome scores, demonstrated enhanced collaborative skills, and exhibited greater learning motivation compared to the students in the control class, who employed conventional learning methods. Evidence demonstrates that the STAD approach significantly enhances the caliber of integrated scientific education in junior high schools in Pasaman Regency.

DISCUSSION

The findings of this study demonstrate that the implementation of the Student Teams Achievement Divisions (STAD) cooperative learning model has a substantial and favorable effect on enhancing learning outcomes, collaborative skills, students' positive attitudes towards learning, and motivation to learn in the context of integrated science education in junior high schools in Pasaman Regency. These findings reinforce the theoretical notions discussed in prior literature and enhance our understanding of how cooperative learning methods might be applied in the specific educational context of Indonesia, especially in local contexts such as Pasaman Regency, which has its own cultural characteristics and educational system.

The substantial improvement in student learning outcomes in the experimental class, as compared to the control class, demonstrates the influential impact of the STAD model in enhancing students' comprehension of integrated science material. Research conducted by Slavin (2014) and Disler et al. (2019) supports the idea that cooperative learning enhances student learning outcomes. This is because it allows students to actively engage in learning and participate in in-depth group discussions.

The efficiency of the STAD model heavily relies on the collaboration among students in diverse groups, which allows students with different abilities to help each other understand complex concepts. In the social constructivism theory of Vygotsky (1997), social interaction is an important learning mechanism. Learning occurs not only individually but also through negotiating meaning between group members. Thus, students in experimental classes can clarify their understanding, explore new ideas, and build knowledge collectively through interactions with their friends.

In addition, the STAD approach also provides continuous feedback to students, both through group assessments and individual discussions. Research by Gillies (2016) indicates that this immediate feedback contributes to more effective learning because it helps students correct their mistakes and deepen their understanding of the material being studied. The STAD model creates a learning environment that supports student academic success by combining cooperative learning and continuous feedback.

Students' collaborative skills experienced a significant increase in the experimental class compared to the control class, especially in terms of active involvement, communication, and joint problem-solving.

This increase in collaborative skills aligns with research by Johnson et al. (2014), which states that cooperative learning models, such as STAD, focus on increasing social interactions between students, which can develop their ability to work in teams, share ideas, and solve problems together.

In the context of Indonesian education, where collectivist culture is still dominant (Boud et al., 2016), cooperative learning models such as STAD are very suitable to be implemented because they accommodate social values that emphasize the importance of cooperation and togetherness. Students are invited to support each other and take responsibility for the success of their group, which is a manifestation of the values of cooperation, which are also emphasized in Indonesian culture. Through the learning process in groups, students improve their academic and social skills that are important for everyday life, such as communication, negotiation, and collaboration skills.

Furthermore, research by (Gillies, 2016) shows that collaborative skills are necessary not only in academic contexts but also in the future, as well as 21st-century skills in work and social life. Thus, STAD-type cooperative learning provides long-term benefits for students by helping them develop relevant skills for their adult lives and future careers.

The results of the student perception questionnaire regarding the STAD cooperative learning model show that students feel this method makes it easier for them to understand integrated science concepts, increases their learning motivation, and makes them more involved in group discussions. It supports the findings of Disler et al. (2019) and Slavin (2014), who stated that students involved in cooperative learning generally have a more positive view of their learning process because they feel more motivated and are more actively involved in learning.

This positive perception can also be linked to the social-emotional aspects of cooperative learning. The STAD model allows students to work in supportive groups and help each other, which creates a positive and enjoyable learning environment (Johnson & Johnson, 2008). In this context, students learn from teaching materials and their group social experiences, which can increase their self-confidence and satisfaction with learning. Thus, STAD-type cooperative learning creates a more inclusive learning environment and supports student diversity in the class.

Students learning motivation in the experimental class also experienced a significant increase compared to the control class. This learning motivation, both intrinsic and extrinsic, is influenced by the way learning is carried out. In cooperative learning, students learn for themselves and their group, which provides additional motivation for them to achieve better results (Dat Tran, 2014; Johnson et al., 2014). These results are consistent with motivation theory, which states that active involvement in learning and peer social support can increase students' learning motivation (Slavin, 2014).

The STAD model provides challenges appropriate to students' ability levels, encouraging them to continue to grow. In addition, the reinforcement given to students through group assessments and appreciation of joint efforts also increases their motivation. Research by Slavin (2014) shows that students who engage in cooperative learning tend to have higher motivation because they feel that their efforts are appreciated by group members and by the teacher.

This research confirms cooperative learning theory and social constructivism and provides new insights into how these approaches can be adapted and applied effectively in Indonesia's diverse educational contexts. Given Indonesia's strong culture of collectivism, cooperative learning models such as STAD are very suitable because they harness the power of social interaction and cooperation. It also shows that the cooperative learning approach can be an effective strategy for improving the quality of education, especially in science learning, which is often considered challenging for students.

The practical implications of this research include the importance of teacher training in implementing cooperative learning models effectively. As stated by (Sharan, 2010), the success of cooperative learning depends on the teacher's skills in managing learning groups and ensuring that each student actively participates in the learning process. Therefore, teacher training and professional development programs are necessary to support cooperative learning implementation in various schools effectively.

In addition, this research shows that implementing the STAD model can help overcome several challenges in Indonesian education, such as low student participation and lack of collaborative skills. By providing opportunities for students to actively engage in learning and collaborate with their peers, cooperative learning models can help create learning environments that are more inclusive, dynamic, and oriented toward developing 21st-century skills.

In the context of integrated science learning in junior high schools in Pasaman Regency, the STAD-type cooperative learning paradigm has demonstrated efficacy in enhancing learning outcomes,

fostering collaborative abilities, cultivating positive perspectives of learning, and promoting student learning motivation. The efficacy of this model not only reinforces the principles of social constructivism and cooperative learning but also demonstrates its adaptability to address educational requirements in Indonesia. The STAD model can create a learning environment that is more active and inclusive and supports the development of social skills, which are very important in this era of globalization.

D. CONCLUSION

After conducting research and discussions, it can be inferred that the cooperative learning model known as Student Teams Achievement Divisions (STAD) has notable characteristics and effects on integrated science education in junior high schools in Pasaman Regency. The main characteristic of the STAD model is cooperation in heterogeneous groups, where students with different academic abilities work together to achieve common goals. This model also emphasizes the importance of social interaction and collaboration between students, encouraging them to actively participate in group discussions, help each other, and solve problems collectively. In addition, STAD uses a combination of individual tests and group assessments, which encourages students to study for personal and group success. Group awards for joint achievements increase students' motivation and responsibility for the learning process.

The impact of implementing the STAD model is visible on various aspects of learning. First, student learning outcomes have increased significantly compared to conventional methods. Students in the experimental class can better understand complex science concepts because of in-depth interactions and discussions in groups. Second, students' collaborative skills, such as active involvement, communication, and joint problem-solving, are well developed. Students learn to work together, share responsibility, and support each other in achieving common goals. Third, students show a more positive perception of the learning process. They feel that the STAD model makes it easier to understand the material, increases motivation, and makes learning more enjoyable. Fourth, students' learning motivation also increases because of group appreciation and a sense of responsibility for collective success. Overall, the STAD model helps students understand integrated science material better and develops critical social and collaborative skills for their future lives.

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