

## Application Of The Cooperative Learning Method Supported By The Think-Pair-Share Strategy In Mathematical Concept Understanding

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### ABSTRACT

This study aims to analyze the effectiveness of the cooperative learning method supported by the Think Pair Share (TPS) strategy in improving students' understanding of mathematical concepts, particularly at SDN Karangtanjung 2, with a population of all students at the school and a sample of 26 students from class V. This research uses a quantitative approach with a quasi-experimental method and non-random sampling technique. The instruments used are subjective tests that have been tested for validity and reliability. The data analysis prerequisite tests include descriptive statistics to provide an overview of the mathematics learning outcomes at each school, with mean and standard deviation values. The results of the study show a significant increase in the average score of students from 53.23 (pretest) to 74.27 (posttest), with a decrease in standard deviation, indicating improved homogeneity of results. The normality test shows that the data are normally distributed, while the paired sample t-test results (Sig. = 0.000) confirm a significant difference in students' abilities before and after the lesson. The TPS method allows students with varying levels of ability to support each other in understanding the material, thus improving learning outcomes uniformly. Therefore, this method can be recommended as an effective learning strategy to enhance students' understanding of mathematical concepts.

**Keywords:** Cooperative Learning, Think Pair Share, Mathematical Concept Understanding.

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## A. INTRODUCTION

In education, improving students' understanding of mathematical concepts is a crucial issue (Unaenah et al., 2023). To enhance the quality of classroom learning, educators focus on this challenge. This is because understanding mathematical concepts forms a strong foundation for learning other mathematical topics and addressing problems in everyday life (Zulmaulida et al., 2024). Therefore, relevant teaching strategies are essential to enhance students' understanding of mathematical concepts. Cooperative Learning based on the Think Pair Share (TPS) strategy has proven effective in fostering students' understanding of mathematical concepts through collaboration and interaction (Damanik & Nasution, 2024). Hence, educators must continue elaborating and implementing creative teaching strategies that meet students' needs.

Several previous studies have shown that using the Cooperative Learning method based on the TPS strategy can significantly increase students' learning motivation and learning outcomes. Research conducted by (Rahim et al., 2024) found that the use of the TPS cooperative learning model improved middle school students' understanding of mathematical concepts. The achievement margin of all students for each concept interpretation indicator increased from the pre-cycle to cycle I. A subsequent study by (Aisyah et al., 2024) showed that collaboration among students using the TPS cooperative learning model met the criteria with an achievement of 85.41%. One student received a "good" rating with 75% of the data, and eleven other students received a "very good" rating. The Cooperative Learning method based on the TPS strategy can also be applied to foster students' independent character. A study by

(Gunawan et al., 2023) indicated that the TPS-based Cooperative Learning method had a substantial impact on enhancing students' independent character. Further research also showed that cooperative learning could foster students' creativity (Rahmadhani et al., 2024). In addition to fostering creativity, cooperative learning using visual media contributes to improving students' overall learning abilities (Ewisahrani et al., 2024).

This study focuses on using the TPS cooperative learning method to enhance students' interpretation of mathematical concepts at SD Negeri Karangtanjung 2. The goal is to combine a cooperative approach that encourages active involvement to overcome the limitations in students' understanding of mathematical concepts. To enhance understanding through social interaction, this approach involves pair and small group discussions (Hidayah, 2023). Unlike previous studies that focused on intermediate or specific contextual topics, such as fractions or problem-based mathematical literacy, this research focuses on implementation at the elementary school level. Furthermore, this study addresses gaps in previous research, such as the lack of comprehensive measurements of student interaction processes and how these impact overall learning outcomes.

This study aims to address the problem of students' low understanding of mathematical concepts by applying the TPS-based cooperative learning method, with the goal of determining how effective the implementation of this method is in fostering students' understanding of mathematical concepts at SD Negeri Karangtanjung 2. The main hypothesis proposed is that cooperative learning with the TPS strategy is beneficial in fostering cognitive independence, communication within teams, sharing with others, and encouraging

students to participate in group activities. This is based on the argument that collaborative interaction can support deeper learning by discussing and reinforcing concepts (Pitra Pebrianti & Haki Pranata, 2018).

Previous studies have shown that TPS fosters mathematical literacy skills and learning outcomes through context-based learning but lacked focus on understanding basic mathematical concepts equivalent to elementary school. The purpose of this research is to demonstrate that TPS not only has the potential to develop students' conceptual understanding but also encourages students to become more actively engaged in learning addressing a common obstacle in elementary level mathematics education.

## **B. LITERATURE REVIEW**

### **Cooperative Learning Method**

#### **1. Definition and Basic Concept of Cooperative Learning**

Cooperative learning is a learning method that involves students working together to achieve common learning outcomes. This definition is supported by Chowdhury & Takad Ahmed (2021) who describe cooperative learning as an approach where students form micro-teams guided by teachers to improve group and individual learning. Cooperative learning is considered the first stage of the learning process. Additionally, (Abramczyk et al., 2020) define cooperative learning as an evidence-based teaching approach that structures how students interact with each other and trains them to work together in micro-teams to achieve mutually supportive learning outcomes.

This method encourages students to support each other throughout the learning process, creating an effective and collaborative learning environment. It not

only enhances academic performance but also builds interpersonal skills and individual student responsibility. Further research by (Gillies, 2016) defines cooperative learning as a method in which students work together to achieve a common goal or solve tasks that cannot be solved by individuals alone. Cooperative learning is considered an effective pedagogical approach for stimulating students to socialize and engage in mutual learning from preschool through higher education.

There are five core components that support the success of cooperative learning. First, positive interdependence, as (Lou et al., 2001) assert, a collaborative approach that involves micro-level teamwork can have a significant positive effect compared to individual work. Second, promotive interaction, where students collaborate constructively to achieve shared goals, provide necessary assistance, share resources, challenge each other's conclusions and reasoning to enhance understanding, and offer beneficial feedback (Johnson & Johnson, 1990).

Third, individual accountability is a crucial aspect of cooperative learning, ensuring that each team member is responsible for their own tasks. This is important to ensure that all students contribute actively and that no one relies solely on the efforts of others (Sibomana et al., 2021). Fourth, clear social skills are taught, and lastly, group reflection. Group reflection becomes a significant point that supports the success of cooperative learning (Karo et al., 2023).

#### **2. Goals of Cooperative Learning Method**

The cooperative learning method has several objectives, including:

##### **a. Improving Academic Outcomes**

According to El Mahanani (2022) cooperative learning has been shown to significantly improve students' academic

outcomes, particularly from the beginning of cycle I to cycle II. Other research indicates that students' academic results in Indonesian language learning at the fourth-grade level can improve when using cooperative learning models like the Team Game Tournament (TGT) (Marwati et al., 2023).

b. Developing Interpersonal Skills

Interpersonal skills refer to students' ability to interact with group members, share ideas, solve problems together, and provide feedback to each other. The research shows that cooperative learning is highly effective in developing students' social skills as it helps them learn through interaction with group members. These social skills include communication, teamwork, and idea sharing (Alwi et al., 2024).

c. Increasing Learning Motivation

Research shows that the appropriate implementation of collaborative learning methods can significantly increase students' motivation to learn (Musdalifah, 2023).

d. Creating Positive Interaction

One of the main findings of this point is that cooperative learning allows students to interact and depend on one another, which creates a positive learning atmosphere and reduces anxiety. This positive interaction allows students to support each other and work together to complete math tasks, which makes them more motivated and confident (MZ et al., 2018).

3. Types of Cooperative Learning Methods

a. Jigsaw

Jigsaw is a cooperative learning model designed to enhance students' understanding by working in heterogeneous micro-teams (different abilities). Each team member is responsible for mastering specific parts of the material and then teaching those parts to other group members. Afterward, each member returns to their original group to share their discussion results.

This method allows students to learn effectively and act together by building positive interactions and mutual support (Lisyalama & Puspita, 2024). Research on the Jigsaw type shows that using this model can increase collaboration skills, as seen in the rise of group participation, teamwork, and communication, from 60% in cycle I to 85% in cycle II.

b. Think-Pair-Share

This method consists of three main stages: think, pair, and share (Singh, 2020). In the first stage, students are given time to think about answers or solutions individually. In the second stage, they pair up with a partner to exchange ideas and deepen their understanding. Finally, in the third stage, students present the results of their discussion to the entire class. This method improves students' speaking skills and boosts their confidence. Research conducted by (Silva et al., 2022) found that cooperative learning methods like TPS and RoundTable foster critical thinking skills in fourth-grade students more effectively than conventional learning approaches.

c. Numbered Heads Together (NHT)

Numbered Heads Together is a cooperative learning method that aims to increase student participation and understanding. This method divides students into micro-teams, and each team is assigned a number (Mahmudah & Rasyid, 2022).

d. Group Investigation (GI)

Group Investigation is a cooperative learning approach where students work together in micro-teams to study a topic thoroughly. In this approach, students form groups based on topics of interest, plan and carry out investigations, and compile their findings into a group presentation to share with the class.

4. Challenges in Cooperative Learning and Efforts to Resolve Them

During the implementation of cooperative learning, several challenges can

arise. According to (Galindo-Domínguez et al., 2024), five common issues often appear, including lack of group member engagement, poor time management, difficulty in scheduling, uneven task distribution, and lack of communication. Some strategies to resolve these issues include calm dialogue, increasing coordination and communication, speaking with the teacher, and fostering open feedback.

### **Think Pair Share**

#### 1. Definition and Basic Concepts

Think-Pair-Share (TPS) is a cooperative learning method designed to enhance students' ability to interact with one another (Ummi Muti'ah et al., 2023). One of the approaches within cooperative learning, TPS also aims to foster students' critical thinking skills (Rejeki Tulus et al., 2023). According to (Fachrul F & Nurlizawati, 2023), Think pair share is a cooperative learning method that can improve students' academic results.

Furthermore, research by (Jumrah, 2023) Furthermore, research by Jumrah (2023) found that the TPS cooperative model helped students in class XI IPA1 at SMA Negeri 1 Tanete Rilau learn mathematics effectively on the topic of sets. Based on these definitions, it can be concluded that the Think-Pair-Share cooperative learning method aims to change the way students interact, leading to increased learning effectiveness, better academic results, and fostering a more critical approach to learning.

Frang Lyman and his colleagues developed the TPS strategy at the University of Maryland (Ummi Muti'ah et al., 2023). In general, TPS is a cooperative learning approach aimed at increasing student participation and critical thinking skills. This

strategy involves three main steps: Think, Pair, and Share. The steps in implementing Think-Pair-Share are as follows: 1) Think, students are given time to consider the teacher's question or problem and come up with a solution on their own. 2) Pair, students discuss their ideas with a partner to exchange thoughts and deepen their understanding. 3) Share, the entire class listens to the pairs share their discussion results.

In a student worksheet (LKPD), the learning activities are based on the syntax of cooperative learning through the TPS model, which includes five stages: the initial stage, Think, Pair, Share, and Reward stages (Miralda & Marhaeni, 2023).

#### 2. Benefits of TPS

##### a. Improving Academic Results

Research by (Noge et al., 2023) indicates that students' academic achievement in science can be improved through the Think-Pair-Share (TPS) cooperative learning model.

##### b. Increasing Student Participation in the Learning Process

Mamad (2023) in his research titled "Improving Science Learning Outcomes Using the Think-Pair-Share Cooperative Learning Model in Class V Students of SDI Rutosoro," suggests that using Think-Pair-Share in Qur'an-Hadith learning helps increase student engagement and academic achievement.

##### c. Developing Critical Thinking Skills in Problem-Solving and Communication

Ramdhani et al. (2022) describe the potential of using Think-Pair-Share as a learning instrument to develop students' skills in solving physical problems. Their findings show that this learning tool can be effectively used to improve students' problem-solving abilities in physics.

##### d. Enhancing Concept Understanding through Discussion and Collaboration

Research on collaboration skills indicates that students in the Think-Pair-Share model, when combined with the Education for Sustainability Development (ESD) approach, are better able to collaborate than those in traditional learning models. The results show that the Think-Pair-Share model with ESD has a positive impact on students' collaboration skills (Priandini & Aristiawan, 2024)

### 3. Factors for Success

#### a. Good Classroom Management

One important aspect of classroom management is creating an organized and clean environment. A well-arranged classroom and furniture set up properly can create an engaging learning atmosphere (Dania & Sukma, 2020).

#### b. Choosing Appropriate and Challenging Questions

Appropriate and challenging questions are crucial for the success of the Think-Pair-Share method. Such questions can motivate each student group to engage more fully. On the other hand, dull and non-challenging questions can lead to decreased student enthusiasm, making the learning process less effective and efficient.

#### c. Forming Heterogeneous Groups to Maximize Interaction

Haryanti (2019) states that forming heterogeneous groups is an important strategy in cooperative learning to ensure that every student can contribute and learn from one another. Heterogeneous groups allow students with different backgrounds and abilities to work together, resulting in more dynamic interactions and supporting a better learning process.

### 4. Evaluation and Reflection

Evaluation is crucial in learning. There are two types of evaluations to measure students' understanding and contribution when using the Think-Pair-Share method: individual evaluation and group evaluation (Sumarsya & Ahmad, 2020). Reflection is

conducted to assess how well the learning objectives have been achieved and to identify areas for improvement.

### C. METHOD

This study uses a quantitative approach with a quasi-experimental method. Quasi-experiment is one of the techniques used in quantitative research to collect and analyze data designed for testing causal relationships with a single group design (Nurhikmah; Indo, 2023). In this case, the research was conducted in one class as the research subject to test the treatment applied in mathematics learning using the cooperative learning method assisted by the Think-Pair-Share strategy to improve students' understanding of mathematical concepts.

The study was conducted at SDN Karangtanjung 2 with the entire student population of the school, and the sample consisted of 26 students from class V, selected using non-random sampling techniques. The instrument used was a subjective test that had been validated for its reliability and validity. This was to measure students' understanding of mathematical concepts and provide a more elementary view of the mathematical concepts being studied.

The data analysis prerequisite tests used include descriptive testing to provide an overview of the results of mathematics learning at the school, with average values and standard deviations. This helps to understand data distribution and allows for interpretation, such as identifying data patterns and making preliminary predictions before conducting inferential statistical tests. The standard deviation value helps to determine whether the data tends to cluster around the mean or deviate from it, indicating the central tendency. Therefore,

the standard deviation allows for a clearer view of whether the data is consistent or varies significantly.

Next, an inferential statistical test is conducted using a paired samples t-test, which is used to compare two means from two paired samples or for a comparative test between two observation values, such as before and after the treatment, to observe the relationships and differences in mathematics learning using the cooperative learning method assisted by the Think-Pair-Share strategy in students' understanding of mathematical concepts. If the data is normally distributed, a parametric statistical test, specifically the paired samples t-test, will be used. If the data is not normally distributed, a non-parametric statistical test, the Wilcoxon test, will be conducted. Normality testing of the data will be done using the Kolmogorov-Smirnov test with the help of SPSS version 26.

#### D. RESULTS AND DISCUSSION RESULTS

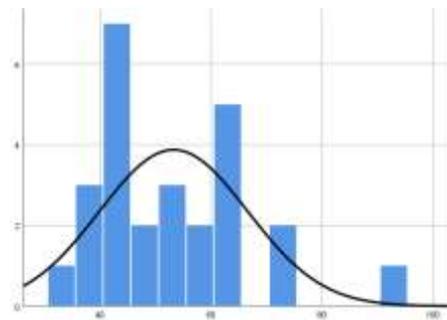
**Table 1.** Statistics

	Pretest	Posttest
Mean	53.23	74.27
Std. Deviasi	13.38	12.73
Range	60	48
Minimum	33	46
Maximum	93	94

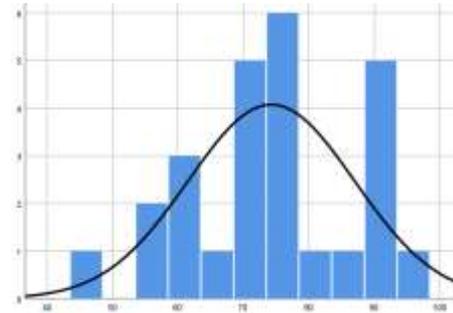
Based on Table 1 above, it can be seen that the average scores of the pretest and posttest were 53.23 and 74.27, respectively, while the standard deviations were 13.38 and 12.73. This indicates that the average scores before and after the treatment using the cooperative learning method assisted by the Think-Pair-Share strategy for improving students' understanding of mathematical concepts showed improvement. The standard deviation of the

posttest scores is smaller compared to the pretest, suggesting that the spread of data for the average scores tends to approach the mean after the learning intervention.

Additionally, the maximum and minimum scores for the pretest and posttest show a range of 60 and 48, respectively, with significant differences and improvements observed in the scores after the learning intervention. This can be seen in the chart below.



**Picture 1.** Normal Curve Pretest



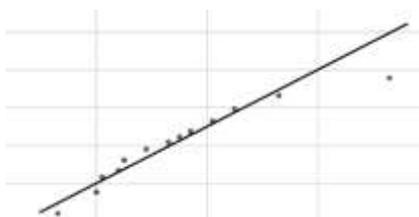
**Picture 2.** Normal Curve Posttest

However, the descriptive values need to be examined further using inferential statistical tests by checking the data's normality to determine whether there are any significant relationships and differences before and after the mathematics learning intervention using the cooperative learning method assisted by the Think-Pair-Share strategy for students' understanding of mathematical concepts, as follows.

**Table 2.** Tests of Normality

	Statistic	Sig.
Pretest	.154	.116
Posttest	.122	.200*

Based on Table 2 above, it can be seen that the significance values for the pretest and posttest are 0.116 and 0.200, respectively. From this data, it is apparent that the Sig. value is greater than 0.05, so it can be concluded that the pretest and posttest data on mathematics learning using the cooperative learning method assisted by the Think-Pair-Share strategy for students' understanding of mathematical concepts are normally distributed.



**Picture 3.** Normal Q-Q Plot of Pretest



**Picture 4.** Normal Q-Q Plot of Posttest

Based on Figures 3 and 4 above, it can be seen that the data points on the diagram are spread around the diagonal line, with only a few points far from the line. Therefore, it can be concluded that the pretest and posttest data on mathematics learning using the cooperative learning method assisted by the Think-Pair-Share strategy for students' understanding of mathematical concepts are normally distributed.

**Table 3.** Paired Samples Correlations

	Correlation	Sig.
Pretest & Posttest	.595	.001

Based on Table 3 above, it can be seen that the significance value for the pretest and posttest is 0.001. From this data, it is evident that the Sig. value is  $< 0.05$ , which allows us to conclude that there is a significant relationship between students' mathematical concept understanding before and after the learning process using the cooperative learning method assisted by the Think-Pair-Share strategy. Meanwhile, the correlation value of 0.595 indicates a strong correlation between students' understanding of mathematical concepts before and after the learning process using this cooperative learning method.

**Table 4.** Paired Samples Test

	t	Sig.
Pretest & Posttest	-9.117	.000

Based on Table 4 above, it can be seen that the significance value is 0.000. From this data, the Sig. value is  $< 0.05$ , which means that, based on the decision criteria,  $H_0$  is rejected. Therefore, it can be concluded that there is a significant difference in students' mathematical concept understanding before and after participating in learning using the cooperative learning method assisted by the Think-Pair-Share strategy.

## DISCUSSION

The research results indicate that the implementation of the cooperative learning method assisted by the Think-Pair-Share (TPS) strategy has a significant impact on students' understanding of mathematical concepts. Based on the descriptive data analysis in Table 1, there is an increase in the average score from 53.23 in the pretest to 74.27 in the posttest. This confirms that the applied learning method is effective in

improving students' understanding of mathematical concepts. Additionally, the decrease in the standard deviation from 13.38 in the pretest to 12.73 in the posttest indicates that the distribution of students' scores became more homogeneous after the learning, showing that students were able to absorb the material more evenly.

A significant improvement is also observed in the minimum and maximum scores, with the range increasing from 48 to 60. This illustrates that the TPS method not only enhances the average understanding of students but also has a positive impact on all students, both those with low and high initial abilities.

From the normality data analysis in Table 2, the significance values for the pretest and posttest were 0.116 and 0.200, respectively. Since the Sig. value  $> 0.05$ , it can be concluded that the data is normally distributed, indicating that the data is valid for further inferential analysis. The data distribution visualization in Figures 3 (Normal Q-Q Plot Pretest) and 4 (Normal Q-Q Plot Posttest) also supports this finding, with data points distributed around the diagonal line.

The correlation analysis results in Table 3 show a strong relationship between students' mathematical concept understanding before and after the learning process, with a correlation value of 0.595 and a significance value of 0.001 (Sig.  $< 0.05$ ). This correlation indicates that the improvement in students' understanding during the learning process was both consistent and significant, emphasizing that the TPS method effectively builds logical connections between the concepts learned by students.

Next, the paired sample t-test in Table 4 reveals a significant difference between students' abilities before and after the

learning process ( $t = -9.117$ , Sig. = 0.000). These results show that the cooperative learning method assisted by the TPS strategy has a tangible effect on students' understanding of mathematical concepts, leading to the rejection of the null hypothesis ( $H_0$ ).

Overall, the findings of this study strengthen the evidence that the TPS method, as part of cooperative learning, provides students with opportunities to work together, share ideas, and discuss concepts, which ultimately helps them better understand the material. This strategy also allows students with various ability levels to support each other in learning, which is reflected in the increase in average scores and the homogeneity of the results.

Slavin explains that cooperative learning allows students of various abilities to work together in small groups, where more capable students can help their peers understand the material, thus improving overall learning outcomes and reducing gaps between students (Nurhikmah, 2024). Furthermore, Trianto adds that group-based learning, such as Think-Pair-Share, encourages students to share understanding and learn from each other's experiences, which not only improves average scores but also creates more homogeneous results among students of different ability levels (Tamphu et al., 2024). Furthermore, Trianto adds that group-based learning, such as Think-Pair-Share, encourages students to share understanding and learn from each other's experiences, which not only improves average scores but also creates more homogeneous results among students of different ability levels (Rosdiana et al., 2022). Therefore, this method can be recommended as an effective learning strategy for enhancing students' understanding of mathematical concepts.

## E. CONCLUSION

The research results show that the application of the cooperative learning method assisted by the Think-Pair-Share (TPS) strategy significantly improves students' understanding of mathematical concepts. This is evident from the increase in the average pretest score of 53.23 to 74.27 on the posttest, indicating a positive change in students' abilities after the learning process. Additionally, the decrease in the standard deviation on the posttest to 12.73 compared to the pretest value of 13.38 indicates that the learning outcomes became more evenly distributed and that students' scores were more closely aligned with the average score.

Inferential analysis supports these results by showing that the data is normally distributed, as evidenced by the normality test and Q-Q plot visualizations. The strong correlation between the pretest and posttest scores, with a value of 0.595 and a significance of 0.001, indicates a significant relationship between students' initial abilities and their final results after using the TPS learning method. Moreover, the paired sample t-test reveals a significant difference ( $t = -9.117$ ; Sig. = 0.000) between students' abilities before and after the learning process, confirming the effectiveness of the TPS method in improving students' understanding of mathematical concepts.

Overall, the TPS method in cooperative learning has proven to be effective in enhancing students' comprehension. This method provides students with opportunities to collaborate, discuss, and exchange ideas, helping them understand concepts more effectively. These findings have practical implications for educators, suggesting that the adoption of the TPS learning strategy can be an alternative to creating an active, interactive,

and effective learning environment, particularly in improving students' understanding in mathematics.

## F. AUTHOR'S NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The author confirms that the data and content of the article are free from plagiarism.

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