



Enhancing Student Engagement and Learning Outcomes through the Implementation of the TPS (Think Pair Share) Cooperative Learning Model

***Helmi Rahmawati, Haeriah**

Program Studi Pendidikan Matematika Universitas Qamarul Huda Badaruddin, Bagu LombokTengah, Indonesia

*Corresponding Author e-mail: helmirahmawati18@gmail.com

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Abstract

The issue of low activity and poor learning outcomes in mathematics among high school students is still prevalent. This research aims to enhance the activity and learning outcomes of 10th-grade students at MA Darul Mahmudien NW Montonggamang by implementing the Think Pair Share (TPS) cooperative learning model, specifically in the topic of linear equations and inequalities with a single variable absolute value. A classroom action research was conducted over 3 cycles, involving 26 students as research subjects. Student learning outcome data was collected through evaluation tests, while student and teacher activities were recorded using observation sheets. Descriptive analysis was applied, including the calculation of learning mastery equations and student mathematics learning outcomes. The research findings indicate a progressive increase in student activity scores across the 3 cycles. In Cycle I, the average student activity score was 12.65, categorized as moderate; in Cycle II, it rose to 16.25, categorized as high; and in Cycle III, the score reached 19.33, indicating a very high level of activity. The improvement in learning mastery was evident within each cycle. The average student scores were as follows: Cycle I - 57.8 with a learning mastery rate of 68.97%, Cycle II - 64.60 with a learning mastery rate of 81.82%, and Cycle III - 74.17 with a learning mastery rate of 86.96%. Based on these research outcomes, it can be concluded that the implementation of the Think Pair Share cooperative learning model effectively enhances both the activity and mathematics learning outcomes of 10th-grade students at MA Darul Mahmudien NW Montonggamang in the subject of linear equations and inequalities with a single variable absolute value.

Keywords: Think Pair Share Cooperative Learning, Activity, Learning Outcomes

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INTRODUCTION

Mathematics is a compulsory subject that must be mastered and studied by every learner (student) at every level of education, from preschool to higher education (university), and even in everyday life applications (Haeriah et al., 2022). Mathematics is of paramount importance for the development of knowledge and technology, demanding students to continually advance their understanding and mastery of mathematics (Rahmawati, 2022). Mathematics is a universal science that underlies the advancement of modern technology, playing a vital role in various disciplines and advancing human thinking capacity (Li & Schoenfeld, 2019). The rapid development in the field of information and communication technology today is rooted in the progress of mathematics in number theory, algebra, analysis, probability theory, and discrete mathematics (The Committee on STEM Education of the National Science & Technology Council, 2018), necessitating strong early mathematical proficiency to create future technologies.

Linear equations and inequalities with a single variable absolute value are fundamental concepts in mathematics that have far-reaching implications for understanding the structure and relationships within an equation or inequality. This topic teaches students to analyze, interpret, and solve problems involving the relationship of absolute values with other variables. A robust understanding of these concepts equips students with the ability to solve real-world problems involving inequalities and equations. However, the reality in 10th-grade classrooms at MA Darul Mahmudien NW Montonggamang reveals that the subject of linear equations and inequalities with a single variable absolute value is often perceived as difficult and complex by a majority of students. Many students struggle to grasp the basic concepts, apply formulas, and relate these concepts to real-world situations. This can result in low activity and learning outcomes in mathematics for students. In line with this issue, Fritz et al. (2019) state that students often encounter difficulties in mathematical topics. Furthermore, there are many perceptions suggesting that mathematical mastery is not highly important (Rattan et al., 2012), leading to many students not studying mathematics further after feeling that they don't need it in everyday applications (Li & Schoenfeld, 2019), resulting in poor mathematical abilities.

The Think-Pair-Share (TPS) cooperative learning model is an instructional approach oriented towards students, fostering a democratic classroom environment where sharing provides greater opportunities to maximize student potential (Arends, 2012). The TPS cooperative learning model can serve as an alternative solution to address the research issues, as this model explicitly aims to develop cooperative skills and learning content goals for students (Eggen & Kauchak, 2012). This model encourages active interaction among students through thinking, discussing, and sharing understanding. Students are prompted to think independently, engage in small-group discussions, and share ideas or solutions with the whole class (Irma et al., 2020). Through this collaboration, it is expected that students can build a deeper understanding of the taught mathematical concepts. TPS generally involves three stages: (1) "think," which focuses on presenting questions or issues and allows each student a few minutes to contemplate their answers individually; (2) "pair," which involves students pairing up with others and discussing their thoughts from the first stage for about 4-5 minutes. The anticipated interaction is for students to share answers to questions or ideas once issues have been identified; and (3) "share," during which students (with their partners) are asked to share and discuss their ideas/solutions with the entire class. Students are not only expected to discuss their solutions but also the process of formulating and applying the offered solutions (Arends, 2012).

Several prior research outcomes indicate the positive impact of the TPS model on improving student mathematics activity and learning outcomes. Marhaeni and Nuryadi (2022), who conducted a study on enhancing student learning activity in mathematics using the TPS model, identified that the TPS model had a more favorable impact on students' mathematics learning activity ($25.31 > 15.78$). These research results are attributed to the fact that the TPS learning model enables students to think, respond, and present teacher-provided problems, ensuring their active involvement in the mathematics learning process. Conversely, Rustanuarsi (2019) found that the TPS model could enhance students' self-confidence in learning mathematics. Unlike these studies, this research is focused on 10th-grade students and aims to improve both activity and learning outcomes in the topic of linear equations and inequalities with a single variable absolute value at MA Darul Mahmudien NW Montonggamang.

METHOD

The classroom action research consists of four stages: (1) planning, involving the development of a lesson plan, preparation of teaching materials, creation of student worksheets, arrangement of tools and materials, development of teacher and student activity observation sheets, and preparation of assessment tools; (2) implementation of actions, entailing the execution of teaching and learning activities; (3) observation of action

implementation using observation sheets; and (4) reflection, conducted based on the obtained data analysis results, to identify shortcomings and assess achievements. The simplified flow of this research is presented in Figure 1.

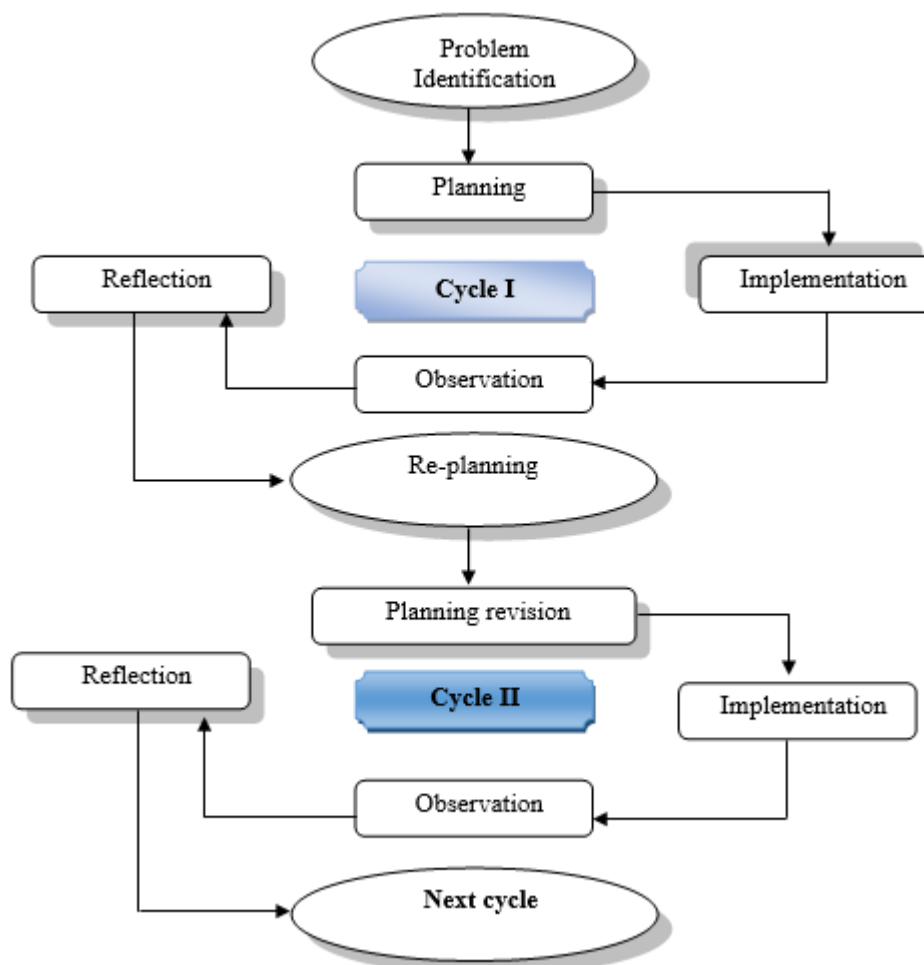


Figure 1. Research Flow (Muhali et al., 2020)

This study was conducted in the 10th-grade classroom of MA Darul Mahmudien NW Montonggamang, involving 26 students as research subjects. The treatment given in this research involved the implementation of the Think-Pair-Share (TPS) cooperative learning in three action cycles. The research instruments utilized in this study comprised observation sheets to collect qualitative data on both teacher and student activities during the learning process, and a learning outcome test to obtain quantitative data on students' learning outcomes in the subject of linear equations and inequalities with a single variable absolute value. The test employed was in essay format, consisting of five questions with equal scoring weight. This was done to assess the extent of students' comprehension of the provided material. The obtained scores were then converted to grades within a range of 0 to 100. Subsequently, these scores were categorized based on the Minimum Mastery Criteria (KKM) established by the school for the mathematics subject, which is 65. This KKM value was utilized to determine the percentage of students who met the mastery criteria. Learning outcome data were collected through tests administered to the students at the end of each action cycle, while data regarding the teaching and learning situation during the action were obtained from observation sheets.

Classical mastery was determined using Equation 1, where KK represents Classical Mastery; K is the number of students who achieved a score ≥ 65 ; and Z is the total number of students. Classical mastery is considered achieved if the percentage of students meeting the classical mastery criteria is $\geq 85\%$, indicating that at least 85% of the students scored above 65 (Sukaisih et al., 2020).

$$KK = \frac{K}{Z} \times 100 \% \dots\dots\dots (1)$$

Student activities were observed in a classical manner using observation sheets. Student learning activity scores were analyzed using Equation 2, where A represents the average score of student learning activity; $\sum X$ is the sum of scores for each descriptor; and n is the number of descriptors (Nurkencana & Sunartana, 1992).

$$A = \frac{\sum X}{n} \dots\dots\dots (2)$$

Student activity scores depend on the number of students in the classroom who actively engage in activities according to the descriptors of observed indicators. Scoring of student and teacher activities is determined based on the following criteria: Score 3 when $A \geq 75\%$ of students perform the observable descriptor; Score 2 when $50\% \geq A < 75\%$ of students perform the observable descriptor; Score 1 when $25\% \geq A < 50\%$ of students perform the observable descriptor; and Score 0 when $A < 25\%$ of students perform the observable descriptor. The obtained scores are then categorized using Table 1.

Table 1. Criteria for Student and Teacher Activities

Interval	Category
$A \geq Mi + 1.5 Sdi$	Very High/very good
$Mi + 0.5 SDi \leq A < Mi + 1.5 Sdi$	High/good
$Mi - 0.5 SDi \leq A < Mi + 0.5 Sdi$	Enough
$Mi - 1.5 SDi \leq A < Mi - 0.5 Sdi$	Low/poor
$A < Mi - 1.5 Sdi$	Very low/very poor

RESULTS AND DISCUSSIONS

This study was conducted over three cycles, involving both students and teachers in the learning process. Data collection was carried out through qualitative observation of student and teacher activities, as well as quantitative data in the form of students' learning evaluation results through end-of-cycle tests. The observation results indicated an improvement in both student and teacher activities (Table 2), as well as student learning outcomes (Table 3), in line with the implementation of the Think-Pair-Share (TPS) cooperative learning model in the 10th-grade classroom of MA Darul Mahmudien NW Montonggamang.

Table 2. Results of Student and Teacher Activity Observations

Subject	Cycle I		Cycle II		Cycle III	
	Average score	Criteria	Average score	Criteria	Average score	Criteria
Student	12.65	Enough	16.25	High	19.33	Very high
Teacher	14.47	Good	17.88	Good	26.49	Very good

At the beginning of Cycle I, it was observed that the formation of discussion groups was not fully aligned with the TPS stages. Some high-ability students were more focused on individual work, and there was a lack of clear task distribution. Teacher-student interactions were also not optimal, resulting in low-ability students primarily receiving information. These findings indicated the need for improvements in the TPS model implementation.

Based on the reflection from Cycle I, adjustments were made in Cycle II. Students became more active in task distribution, correcting each other's answers, and assisting struggling peers. However, there were still some students who were less active in asking questions to their peers during discussions. In Cycle II, measures were implemented to

encourage students to be more open and collaborative. Teacher-student interactions became more focused, providing guidance and motivation for effective cooperation.

In Cycle III, significant progress was observed in student activities and learning outcomes. High-ability students took an active role in assisting peers who were struggling, and interactions among group members improved. Students who were previously less enthusiastic about learning began to show interest and a desire to learn. In this learning process, students not only could solve challenging problems but also actively participated in discussions and provided feedback on other groups' presentations.

Table 3. Student Learning Achievement Results

Components	Results		
	Cycle I	Cycle II	Cycle III
Number of students	26	26	26
Lowest score	40	47	55
Highest score	75	97	98
Average score	57.8	64.6	74.17
Involved students	23	22	23
Students completed	10	18	20
Classical completeness	68.97%	81.82%	86.96%
Note	Not complete yet	Not complete yet	Complete

This study illustrates how the gradual implementation of the Think-Pair-Share (TPS) cooperative learning model enhances students' activity and learning outcomes. These findings support previous research, such as that conducted by Bafaqih et al. (2019), who found that cooperative learning-oriented instruction improves student engagement and learning outcomes. The results are also consistent with the findings of Mz et al. (2017), showing that collaboration in learning can enhance students' problem-solving skills. On the other hand, Saputra et al. (2019) found no significant difference in mathematics learning outcomes between students taught with a cooperative model and those in a control group taught using conventional methods.

The TPS model encourages active engagement of all students in the learning process. In the "Think" phase, students think independently about mathematical concepts or problems, stimulating critical and analytical thinking. The "Pair" phase allows students to collaborate in small groups, exchange ideas, and collectively deepen their understanding. The "Share" phase provides each group an opportunity to share their solutions or understandings with the class, broadening all students' insights (Tint & Nyunt, 2015). The achievement of students' mathematics learning outcomes is also supported by small-group discussions where students can discuss mathematical concepts from various perspectives. This activity, as described in some literature, helps students build a deeper understanding by articulating their thoughts and considering their classmates' viewpoints (Amir Mz et al., 2021). Group discussions can also reveal diverse perspectives and creative problem-solving methods, enriching students' understanding of the concept.

The TPS model also cultivates students' communication skills. In the "Pair" phase, students must discuss and communicate with their peers about solutions or understandings. This process aids students in expressing ideas clearly and learning to listen to others' viewpoints. Effective communication skills are crucial not only for understanding mathematics but also in various aspects of life (Palupi et al., 2019). The TPS model fosters cooperation within groups. Students need to help and support each other during discussions and sharing. This nurtures teamwork skills and fosters a culture of mutual assistance among students. Students feel collectively responsible for understanding the material and the group's success (Habibi, 2020).

The TPS model makes mathematics learning more interactive and engaging. This was also observed in this research, where student activity increased in each action cycle. Diverse student activities, such as independent thinking, discussions, and presentations, reduce monotony and engage students more actively. This helps maintain students' interest and motivation in learning mathematics. Furthermore, the TPS model allows teachers to provide direct feedback to students during the "Share" phase. Teachers can clarify misconceptions, elaborate on concepts, or offer positive encouragement. This feedback assists students in rapidly and effectively improving their understanding (Purwanto et al., 2020).

CONCLUSION

The Think-Pair-Share (TPS) cooperative learning model is effective in enhancing student activity and mathematics learning outcomes in the topic of linear equations and inequalities with a single variable absolute value in the 10th-grade classroom of MA Darul Mahmudien NW Montonggamang. The implication of this finding is that cooperative approaches like TPS can serve as an effective alternative to address challenges in mathematics education at the secondary school level. The TPS model provides tangible support for social interaction, collaboration, and conceptual understanding, aiding students in developing skills that are not only relevant to mathematics but also to everyday life. Therefore, educators should consider adopting this approach to enhance the quality of mathematics education in the classroom.

RECOMMENDATION

Based on the findings of this research, several recommendations can be proposed to enhance the effectiveness of mathematics education in the topic of linear equations and inequalities with a single variable using the Think-Pair-Share (TPS) cooperative learning model, including: (1) teachers should receive training and development related to the effective implementation of the TPS model. This training should encompass a deep understanding of the TPS stages, various strategies that can be employed in group discussions, and techniques to facilitate productive interactions among students. Teachers also need to understand how to provide clear instructions to students to ensure a smooth learning process; (2) in implementing the TPS model, teachers are advised to design varied materials and questions that support the understanding of the concept of linear equations and inequalities with a single variable. The materials and questions should encourage critical thinking and reflection and be relatable to real-world situations to enhance the connection to students' everyday lives; (3) teachers should regularly monitor and provide feedback to students regarding their performance in group discussions. This feedback can assist students in comprehending the strengths and weaknesses of their group learning process, as well as encourage them to continually enhance their engagement and contributions in discussions; (4) for students who have achieved a deeper understanding, teachers can design enrichment activities or additional challenges that align with their proficiency level. Furthermore, students facing difficulties should receive additional support, both from teachers and peers, to ensure that no student lags behind in grasping the subject matter; (5) replication of this research can be conducted with different populations and contexts to validate our findings more broadly. Further studies could also investigate other factors that might influence the effectiveness of the TPS model, such as student characteristics, social interactions, and implementation in other subject areas.

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