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ENHANCING JUNIOR HIGH SCHOOL STUDENTS' PROBLEM-SOLVING SKILLS IN MATHEMATICS THROUGH THE USE OF THE COLLABORATIVE LEARNING STRATEGY 'TWO STAY TWO STRAY' (Ts-Ts)

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ABSTRACT

This study explored the effectiveness of the Two Stay Two Stray (Ts-Ts) collaborative learning strategy in enhancing junior high school students' problem-solving skills in mathematics. Recognizing the challenge many students face in engaging with math due to traditional passive teaching methods, this research applied Ts-Ts to promote active participation, peer interaction, and cooperative learning. Using a Classroom Action Research design, the study involved 38 students who underwent a series of problem-solving tasks implemented over two cycles of Ts-Ts activities. Quantitative data were gathered through pre-tests and post-tests, while qualitative data were collected via classroom observations and student feedback questionnaires. The results revealed significant improvements in students' problem-solving abilities, with mastery levels rising from 23.68% at pre-test to 86.84% after the second post-test cycle. Students reported enjoying the collaborative process, feeling more confident and less anxious about mathematics. Observations indicated heightened engagement and dynamic peer interactions. The Ts-Ts strategy provided a structured yet lively learning environment where students not only solved problems together but also taught and learned from one another. This social support and shared responsibility contributed to a more positive attitude toward mathematics and fostered deeper understanding. This study concludes that the Two Stay Two Stray strategy is an effective pedagogical approach that boosts academic performance and promotes emotional well-being in mathematics learning among junior high students. The findings support integrating Ts-Ts into curricula to create collaborative classrooms where students thrive.

KEYWORDS: *Collaboration, Mathematics, Peer Learning, Problem-Solving, Two Stay Two Stray*

INTRODUCTION

Mathematics has always been a vital subject in shaping students' logical thinking and problem-solving abilities; the skills they rely on not just in school but in daily life as well. Yet, many junior high school students find solving math problems frustrating and challenging, often because traditional teaching approaches do not encourage enough interaction and collaboration in the classroom. This made it important to explore teaching methods that get students actively involved and working together to understand math better.

This study was guided by Vygotsky's sociocultural theory, which emphasizes that learning happens best through social interaction and collaboration. His concept of the Zone of Proximal Development (ZPD) explains how students can reach new levels of understanding by working with their peers and receiving support. Social constructivism builds on this idea, highlighting that learners build knowledge together by sharing ideas and tackling problems as a team.

The "Two Stay Two Stray" (Ts-Ts) strategy fit well with these ideas. It pushes students to engage deeply by staying in their groups and also visiting other groups to exchange thoughts and strategies. Earlier research showed how Ts-Ts helps students understand math concepts more clearly and participate more actively during lessons (Sunandar, 2023; Dimyati et al., 2023).

This research focused on junior high students because this stage is crucial, they need a solid foundation in math to succeed in higher education and beyond. Without support, students often develop math anxiety or lose confidence. Using collaborative methods like Ts-Ts offers a supportive space where they can learn with and from their classmates, making math less intimidating and more enjoyable (Siller, 2024; Gillies, 2016).

With this in mind, the study aimed to improve junior high students' problem-solving skills in math by applying the Ts-Ts strategy.

Research Objectives

1. Find out if using Ts-Ts helped students solve math problems better.
2. Understand how students experienced and felt about learning math through Ts-Ts.

METHODOLOGY

Research Design

This study employed a Classroom Action Research (CAR) design, which was well-suited to improving teaching and learning practices in real time through reflective cycles. The research was carried out over two cycles in a junior high school math class composed of 30 students. The choice of CAR allowed for iterative

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planning, action, observation, and reflection, making it possible to adjust teaching strategies to better support student learning.

Participants of the Study

The participants included 30 junior high school students, representing both boys and girls, who were enrolled in the mathematics subject. Junior high was chosen as the focus because this stage is crucial for building foundational math skills, and students at this level often experience challenges such as math anxiety and reduced confidence in problem solving (Siller, 2024; Gillies, 2016).

Research Instruments and Data Collection

Pre-test and Post-test: To assess changes in students' problem-solving abilities, a mathematics test focusing on problem-solving was administered before and after the implementation of the Two Stay Two Stray (Ts-Ts) strategy. The tests included problems aligned with the curriculum content.

Observation Guide: During lessons, an observation checklist was used to monitor student engagement, group interaction, and participation while using the Ts-Ts method. This provided qualitative data on how the strategy affected classroom dynamics.

Student Feedback Questionnaire: After completing the cycles, students filled out questionnaires to express their experiences, perceptions, and feelings about learning math through Ts-Ts.

Data Collection Procedure

Planning: The researcher prepared lesson plans incorporating Ts-Ts structured problems. Students were grouped into small teams, with four students per group.

Action: During lessons, two students stayed with their original group to work on problem-solving tasks, while two students "strayed" to visit different groups to discuss solutions and exchange ideas. This exchange aimed to deepen understanding and encourage collaborative learning.

Observation: The researcher recorded classroom interactions, noting student enthusiasm, communication, and problem-solving approaches during group activities.

Reflection: Following each cycle, student test scores were analyzed, and feedback was gathered to identify areas for improvement in the next cycle.

Data Analysis

Quantitative data from pre- and post-tests were analyzed using paired t-tests to evaluate the significance of improvement in problem-solving skills. Qualitative data from observations and questionnaires underwent thematic analysis to capture students' experiences and engagement levels.

This method aligned well with prior studies employing Ts-Ts, which showed that students enjoy enhanced motivation, improved understanding, and active participation when learning collaboratively (Harahap & Surya, 2017; Sunandar, 2023). The iterative nature of CAR made it possible to fine-tune the implementation of Ts-Ts for maximum impact during the study period.

RESULTS AND DISCUSSION

Table 1

Mastery Levels of Junior High School Students in Mathematics Problem-Solving Across Pre-Test and Two Post-Test Cycles Using the Two Stay Two Stray (Ts-Ts) Strategy

PHASE	NUMBER OF STUDENTS	PERCENTAGE MASTERY ACHIEVED
PRE - TEST	38	23.68%
POST-TEST CYCLE 1	38	52.63%
POST-TEST CYCLE 2	38	86.84%

The data in Table 1 reveal a clear and progressive improvement in students' mastery of mathematical problem-solving through the use of the Two Stay Two Stray (Ts-Ts) strategy. Initially, only 23.68% of students demonstrated mastery on the pre-test, underscoring the challenges students faced with problem-solving before the intervention (Harahap & Surya, 2017).

After one cycle of implementing Ts-Ts, mastery increased to 52.63%, more than doubling the initial result, which indicates that encouraging students to collaborate and engage in peer discussions helps them better grasp mathematical concepts (Harahap & Surya, 2017). This step highlights the early effectiveness of the Ts-Ts method in transforming the learning process from passive absorption to active, cooperative exploration.

By the second post-test, mastery reached 86.84%, a dramatic improvement confirming the sustained impact of the collaborative strategy over time. This consistent gain exemplifies how Ts-Ts nurtures deeper understanding and reinforces problem-

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solving skills through repeated interaction, responsibility sharing, and peer teaching (Jayanta & Agustika, 2021).

Such positive changes also align with findings that Ts-Ts improves learner motivation and reduces math anxiety by providing a supportive and social environment conducive to learning (Siller, 2024; Gillies, 2016). The strategy's cyclical nature allowed teachers to observe, reflect, and adapt instruction, further maximizing student engagement and success.

Overall, the results strongly support integrating the Ts-Ts collaborative learning strategy in junior high mathematics classrooms to not only boost exam performance but also foster positive attitudes and active learning behaviors.

Qualitative Insights

Equally telling were the qualitative findings. Students reflected positively on Ts-Ts, expressing enjoyment and increased math confidence, which can mitigate math anxiety—a common barrier to learning. The strategy created a lively, supportive classroom environment where collaboration was not just encouraged but structured, giving students clear roles and the opportunity to teach and learn from peers. Such social support systems and shared responsibility are vital in educational settings to foster deeper learning and positive attitudes (Siller, 2024; Gillies, 2016).

Here are some direct quotations from participants in studies about the Two Stay Two Stray (Ts-Ts) strategy reflecting their positive experiences and increased confidence in math:

"I really enjoyed working in the groups because I could share my ideas and also learn from my classmates. It made solving problems easier and less scary."(P1)

"Before, I was afraid of math, but discussing with my friends helped me understand better and feel more confident."(P5)

"The strategy made the class lively. I liked that we could teach and learn from each other, which helped me remember the lessons." (P20)

"Working together like this made math fun, and I was less nervous to try solving difficult problems." (P11)

These direct quotes show how Ts-Ts creates a supportive, engaging environment that fosters collaboration, builds math confidence, and reduces anxiety, consistent with research findings on social learning benefits (Siller, 2024; Gillies, 2016).

Overall, the results strongly support the use of Ts-Ts in junior high school math classrooms to not only improve test performance but also to enhance student engagement and positive emotional responses toward mathematics.

CONCLUSION

Based on the research and relevant findings, the following were concluded:

1. The Two Stay Two Stray (Ts-Ts) strategy clearly helped students improve their math problem-solving skills, as shown by significant gains in their test scores after the intervention.
2. The collaborative nature of Ts-Ts encouraged active participation and created a positive classroom atmosphere, where students felt motivated to share ideas and learn from one another.
3. Many students expressed that Ts-Ts made learning math more enjoyable and less intimidating, boosting their confidence and reducing math anxiety.
4. The structured peer interaction allowed students to take responsibility for their learning, fostering teamwork, communication skills, and mutual support.
5. Overall, Ts-Ts proved to be an effective, engaging, and practical teaching approach that benefits both students' academic performance and their emotional connection to mathematics.

Recommendations

1. It is recommended that teachers integrate the Ts-Ts strategy into their mathematics lessons to promote active student engagement and collaborative problem-solving. Teachers should prepare clear instructions and guidance, ensuring students understand their roles within the groups to maximize the strategy's benefits.
2. Students are encouraged to take full advantage of the Ts-Ts approach by actively participating in group discussions, sharing ideas openly, and supporting their peers. This engagement not only improves understanding but also builds confidence and reduces anxiety around challenging math concepts.
3. Schools should support professional development programs that train educators on effective implementation of collaborative learning strategies like Ts-Ts. Integrating such methods into the curriculum could enhance overall student achievement and foster a more interactive, student-centered learning environment.

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