Journal of Biology, Chemistry, Mathematics and Physics Education (BIOCHAMP)

Journal Homepage: https://journal.stedca.com/index.php/biochamp

The Effect of The Student Facilitator and Explaining Cooperative Learning Model on The Mathematical Problem-Solving Ability of Grade IX Students at Junior High School Tiga Hati Kepenuhan Hulu

Pengaruh Model Pembelajaran Kooperatif Tipe Student Facilitator And Explaining Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Kelas IX SMP Tiga Hati Kepenuhan Hulu

Rika Wulandari Br. Purba[1*], Arcat[1], Lusi Eka Afri[1]

[1]Mathematics Study Program, Faculty of Teacher Training and Education,
Universitas Pasir Pangaraian, Indonesia.
*rikaw1276@gmail.com

Diterima: 05 July 2025; Disetujui: 30 Agustus 2025

Abstract

This study aims to determine the effect of the cooperative learning model, Student Facilitator and Explaining, on students' mathematical problem-solving abilities in Grade IX of SMP Tiga Hati Kepenuhan Hulu. The research employed a quantitative approach with a quasi-experimental design. The study subjects were Grade IX students divided into two groups: the experimental group, which was taught using the Student Facilitator and Explaining model, and the control group, which was trained using a conventional learning model. Data were collected through a mathematical problem-solving ability test. The hypothesis testing results showed that the t-value (2.37) was greater than the t-table value (2.12) at a significance level of $\alpha = 0.05$. Therefore, H_0 was rejected and H_1 was accepted. This indicates a significant effect of the Student Facilitator and Explaining cooperative learning model on students' mathematical problem-solving abilities.

Keywords: Student Facilitator, Explaining, mathematical problem-solving

Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran kooperatif tipe *Student Facilitator and Explaining* terhadap kemampuan pemecahan masalah matematis siswa kelas IX SMP Tiga Hati Kepenuhan Hulu. Penelitian ini menggunakan pendekatan kuantitatif dengan desain *quasi experiment*. Subjek penelitian adalah siswa kelas IX yang dibagi menjadi dua kelompok yaitu kelas eksperimen yang menggunakan model pembelajaran kooperatif tipe *Student Facilitator and Explaining* dan kelas kontrol yang menggunakan model pembelajaran konvensional. Teknik pengumpulan data dilakukan melalui tes kemampuan pemecahan masalah matematis. Hasil pengujian hipotesis menunjukkan bahwa nilai t_{hitung} sebesar 2,37 lebih besar dari t_{tabel} sebesar 2,12 pada taraf signifikansi $\alpha = 0,05$. Dengan demikian,

H_0 ditolak dan H_1 diterima. Artinya, terdapat pengaruh yang signifikan dari model pembelajaran kooperatif tipe *Student Facilitator and Explaining* terhadap kemampuan pemecahan masalah matematis siswa.

Kata Kunci: *Student Facilitator and Explaining*, pemecahan masalah matematis

1. INTRODUCTION

The 21st century is marked by rapid technological developments and globalization, which demand students to master basic literacy skills such as reading, writing, and arithmetic, and higher-order skills such as critical thinking, creativity, and collaboration (Mulyati & Evendi, 2020). Education is therefore expected to equip students with relevant competencies to face these challenges. One way to achieve this is through mathematics learning, which is crucial in developing logical reasoning, analytical thinking, and decision-making skills (Jannah, 2020; Tahir, 2020; Doly Nasution et al., 2023).

The National Council of Teachers of Mathematics (NCTM, 2000) and the Indonesian Ministry of Education and Culture Regulation No. 21 of 2016 highlight problem-solving as one of the core goals of mathematics education. Problem-solving ability supports students' logical, analytical, and creative thinking and ability to collaborate effectively (Rahmania et al., 2020). Moreover, mathematical problem-solving is essential in everyday life as it requires preparedness, creativity, and knowledge application (Doly Nasution et al., 2023; Siahaan & Surya, 2020).

However, preliminary test results at SMP Tiga Hati indicated that the mathematical problem-solving skills of ninth-grade students remain low, with an overall average score of 12.55, classified as "low" based on the criteria by Nurul Fadilah & Haerudin (2022). Further analysis showed that many students struggled to identify known and unknown elements in problems, plan appropriate strategies, execute solutions, and review their answers. Classroom observations revealed that teaching was still dominated by the Teacher-Centred or lecture model, where students played a passive role, showed low participation, and lacked confidence in expressing opinions (Asih et al., 2021; Yustinaningrum, 2022).

These conditions highlight the need for student-centred learning models that promote active participation and collaborative problem-solving. One alternative is the Cooperative Learning Model type *Student Facilitator and Explaining* (SFAE), which provides opportunities for students to explain material to their peers. Previous studies demonstrated that SFAE encourages active participation, builds students' confidence, and enhances critical thinking and problem-solving skills (Mulyani, 2016; Tahir, 2020; Yanto & Juwita, 2018).

Based on this context, the present study aims to examine the effect of the Cooperative Learning Model type *Student Facilitator and Explaining* (SFAE) on students' mathematical problem-solving skills at the junior high school level. This study aimed to determine whether or not the cooperative learning model of the student facilitator and explanation type influenced the mathematical problem-solving abilities of class XI students at Tiga Hati Kepenuhan Hulu Middle School.

2. METHODS

This research employed a quasi-experimental design with a two-group posttest-only design (Sundayana, 2018). The experimental group received treatment using the cooperative learning model type Student Facilitator and Explaining

(SFAE), while the control group was taught through conventional teacher-centred instruction.

The study was conducted in the second semester of the 2024/2025 academic year at SMP Tiga Hati, involving all ninth-grade students as the population. A total of 56 students participated in class IX. A (28 students) was assigned as the experimental group, and class IX.B (28 students) was selected as the control group using simple random sampling after testing normality, homogeneity, and equality of means (Sugiyono, 2019).

The research instrument consisted of a mathematical problem-solving test in three essay items developed according to problem-solving indicators: understanding the problem, devising a plan, carrying out the plan, and reviewing the solution. Experts validated the test, and statistical analysis showed that the items met validity, reliability, difficulty, and discrimination criteria (Sundayana, 2018).

Data was collected using a posttest administered at the end of the learning process. The data were analyzed using descriptive statistics and inferential statistics. Before hypothesis testing, data were checked for normality (the Kolmogorov-Smirnov test) and homogeneity (the Fisher test). The research hypothesis was tested using an independent samples t-test to determine the effect of the SFAE model on students' mathematical problem-solving ability.

3. RESULT AND DISCUSSION

Problem-Solving Skills

In this study, students' problem-solving skills were measured using a posttest administered at the end of the session, as stated in the student worksheet (LKPD). The sample consisted of class IX. Class A was the experimental group, which was taught using the Student Facilitator and Explaining (SFAE) learning model, and Class IX.B was the control group, which was trained using the conventional model.

The posttest questions assessed four indicators of problem-solving ability: understanding the problem, devising a plan, carrying out the plan, and reviewing the solution. Each test item incorporated all four indicators. The complete posttest instrument is presented in Appendix 10.

The posttest results of students from the experimental class (IX.A) and the control class (IX.B) are provided in Appendix 11. A descriptive analysis of the posttest data is summarized in Table 1.

Table 1. Descriptive Analysis of Posttest Scores on Mathematical Problem-Solving Ability

Class	N	Mean	SD	Minimum	Maximum
Experimental	20	86,11	13,15	61,11	100
Control	20	75,41	15,17	55,56	100

The descriptive analysis in Table 1 shows that the experimental class (M = 86.11; SD = 13.15) achieved a higher mean posttest score than the control class (M = 75.41; SD = 15.17). While both groups obtained the maximum score of 100, the experimental group demonstrated a higher minimum score (61.11) than the control group (55.56). The smaller standard deviation in the experimental group also indicates that students' scores were more consistent than those in the control group.

Further statistical analyses were conducted based on the posttest data, including normality, homogeneity, and hypothesis testing. The normality test using the Liliefors method showed that both the experimental ($L_{max} = 0.145 < L_{table} = 0.173$) and control class ($L_{max} = 0.155 < L_{table} = 0.173$) data were normally distributed.

The Fisher's homogeneity test indicated that both groups' variances were homogeneous (Fcount = 1.15 < Ftable = 2.12, α = 0.05).

Since the data were normally distributed and homogeneous, a t-test was performed to examine differences in mean scores. The results revealed that the experimental class achieved significantly higher scores than the control class (tcount = 2.37 > ttable = 2.12, α = 0.05). Therefore, H0 was rejected, confirming that the Student Facilitator and Explaining (SFAE) model significantly positively affected students' mathematical problem-solving ability.

This study aimed to determine whether the Student Facilitator and Explaining (SFAE) cooperative learning model significantly affected the mathematical problem-solving abilities of ninth-grade students at SMP Tiga Hati Kepenuhan Hulu. The participants consisted of class IX.A (experimental group) received treatment using the SFAE model, and class IX.B (control group), which was taught using conventional learning. Both groups had the same number of meetings and learning hours. After four sessions, a posttest was administered to measure students' problem-solving abilities.

The posttest data were analyzed using the Liliefors test for normality and Fisher's test for homogeneity. The results showed that the data were normally distributed and homogeneous, meeting the assumptions for parametric testing (Ghasemi & Zahediasl, 2012; Field, 2013). The subsequent t-test revealed a significant difference between the two groups (tcount = 2.37 > ttable = 2.12, α = 0.05), indicating that students taught with the SFAE model achieved higher problem-solving scores than those taught conventionally. This finding supports previous studies emphasizing the effectiveness of cooperative learning strategies (Slavin, 2015; Tahir, 2020).

The higher performance of the experimental group demonstrates that the SFAE model provides meaningful learning experiences. Students were not only passive recipients of knowledge but also actively engaged in explaining and discussing concepts with peers. The process of acting as facilitators encouraged students to communicate ideas, develop critical thinking, and reflect on their learning, which are essential components of mathematical problem-solving (Johnson & Johnson, 2017; Hidayatun et al., 2020).

The learning process in SFAE consisted of three stages: introduction, core activities, and conclusion. During the introduction, teachers prepared students physically and mentally, formed heterogeneous groups, distributed worksheets (LKPD), and assigned facilitators from each group. In the core activities, based on Simamora et al. (2024), the steps included presenting competencies, delivering material, developing material in groups, explaining results, concluding, and evaluating. Contextual examples, such as using the movement of a trolley to illustrate geometric translation, helped students relate mathematics to real-life situations, which has been shown to enhance comprehension and problem-solving (Fitriyani et al., 2016).

Group discussions and peer explanations encouraged students to construct and present solutions, improving confidence and collaborative problem-solving skills. Explaining to peers served as a form of reflection and verification of solutions, addressing all four problem-solving indicators: understanding the problem, devising a plan, carrying out the plan, and reviewing the solution (Polya, 1973). Compared to conventional learning, where students follow a single teacher-directed strategy and have limited opportunities to express ideas, the SFAE model fostered active participation,

confidence, and flexibility in problem-solving.

These findings are consistent with Tahir (2020), who found that SFAE improved students' mathematical problem-solving abilities by making them more active in learning, discussion, and peer explanation. Thus, this study reinforces that the SFAE model contributes positively to students' problem-solving competence in mathematics.

Research Limitations

This study faced several practical limitations. Some students lacked confidence in their role as facilitators, which sometimes hindered group discussions. Limited instructional time also required teachers to shorten stages, reducing learning effectiveness. Technical constraints, such as limited teaching aids, further affected implementation. Not all students participated equally; some remained passive, requiring extra teacher encouragement. Despite these challenges, the findings provide valuable input for refining the implementation of the SFAE model in future research.

4. CONCLUSIONS

Based on the analyzed research data, it can be concluded that the student facilitator and explainer cooperative learning model significantly influences the mathematical problem-solving abilities of eleventh-grade students at Tiga Hati Kepenuhan Hulu Junior High School. Based on the research results, the researcher offers several recommendations. First, mathematics teachers are advised to implement the Student Facilitator and Explainer (SFAE) learning model as an alternative to improving students' mathematical problem-solving abilities. Second, teachers need to guide and motivate students to become confident in their role as facilitators, especially for students who are still passive or unfamiliar with expressing their ideas in front of classmates. Third, schools are expected to support the implementation of innovative learning models such as SFAE through relevant training or workshops for teachers. Finally, future researchers are advised to conduct research over a longer period and with a wider range of subjects so that the results can be more widely generalized.

REFERENCES

Asih, S., Nirawati, R., & Nurhayati. (2021). Pengaruh Model Pembelajaran Student Facilitator and Explaining Terhadap Kemampuan Komunikasi Matematis Siswa pada Materi SPLTV Kelas X MIPA. *Journal of Educational Review and Research, 4*(1): 31–38.

Hidayatun, N.E., Amalia, R.S., & Aristiyo, Nur, D. (2020). Penerapan Model Pembelajaran Student Facilitator and Explaining (SFAE) terhadap Kemampuan Pemecahan Masalah dan Kemampuan Pemahaman Konsep Matematis. *Dialektika P. Matematika*, *7*(2): 382–396

Mulyani, E. (2016). Pengaruh Penggunaan Model Pembelajaran Kooperatif Tipe Student Facilitator and Explaining terhadap pemahaman Matematik Peserta Didik. *Jurnal Penelitian Pendidikan dan Pengajaran Matematika*, *2*(1): 29–34.

Nasution, D.M., & Ramadhan, R., (2023). Pengaruh Model Pembelajaran Problem Solving Terhadap Kemampuan Pemecahan Masalah Siswa Kelas VIII SMPIT Miftahul Jannah. *Journal of Social Science Research*, *3*: 260–268.

Simamora, B.A., Panjaitan, B.M., & Manulu, A. (2024). *Model Pembelajaran Kooperatif*. Perkumpulan Rumah Cemerlang Indonesia. 114 hlm

Sugiyono, D. (2019). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R&D*. Alfabeta. Bandung. 456 hlm.

Sundayana, H. R. (2018). *Statistika Penelitian Pendidikan*. Alfabeta. Bandung

Tahir, T. (2020). Penerapan Model Pembelajaran Kooperatif Tipe Student Facilitator and Explaining (SFAE) untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. *Square : Journal of Mathematics and Mathematics Education*, *2*(1): 41.

Yanto, Y., & Juwita, R. (2018). Penerapan Model Pembelajaran Kooperatif Tipe Student Facilitator and Explaining terhadap Hasil Belajar Matematika Siswa. *Jurnal Pendidikan Matematika*, *1*(1): 53–60