

THE EFFECT OF THE COLLABORATIVE LEARNING MODEL ON JUNIOR HIGH SCHOOL STUDENTS' MATHEMATICS PROBLEM-SOLVING ABILITIES

Lidia Mentari

Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

ABSTRACT

This study aims to determine the effect of the collaborative learning model on student problem-solving. Students were given a test to assess their mathematical problem-solving abilities, as well as their responses and activities related to the learning process. The researcher then described these results in data analysis. The method used was a pre-experimental method with a one-group pre-test, post-test design. This research was conducted at the SPF Technical Implementation Unit (UPTD) of SMP NEGERI 2 IPU BANYAK BARAT with 25 eighth-grade students. The results of the hypothesis test showed a calculated t-value of 16.4037, with a t-table value at the significance level of 0.5, which is 2.060. This means that the calculated t-value is greater than the t-table value, or $16.4037 > 2.060$. Therefore, H_a is accepted and H_0 is rejected. It can be concluded that the collaborative learning model has a significant effect on the mathematical problem-solving abilities of students at UPTD SPF SMP NEGERI 2 IPU BANYAK BARAT.

Keywords: Problem Solving, Collaborative Learning Model

Corresponding Author:

Lidia Mentari
Universitas Muhammadiyah Sumatera Utara

1. INTRODUCTION

Student success in mathematics learning is one indicator of the success of the educational process, both for teachers and students (Munthe et al., 2021). Mathematics learning outcomes reflect not only academic ability but also conceptual understanding acquired during the learning process. However, in practice, mathematics learning still faces challenges. Interviews with eighth-grade mathematics teachers at the SPF Technical Implementation Unit (UPTD SPF) of SMP Negeri 2 Pulau Banyak Barat revealed that students' problem-solving abilities remain low. Out of 100 students, only 39% scored above the minimum passing grade, while the remaining 61% fell below the criteria. This is exacerbated by teacher-centered learning methods, which lead to students becoming passive, less engaged in their thinking processes, and even tending to forget the material taught.

This situation highlights the need for learning innovations that can increase student activity, engagement, and problem-solving skills. One relevant model is collaborative learning, an approach that emphasizes cooperation among students in the exchange of information, ideas, and experiences (Purwaaktari, 2015). Through collaboration, students learn to discover, work together, and take responsibility for solving problems. This model is believed to create more meaningful learning experiences, foster positive interactions, and improve mathematics learning outcomes.

2. METHOD

Research Sample

This study used a random sampling technique. The sample consisted of all 25 eighth-grade students from the UPTD SPF of SMP Negeri 2 Pulau Banyak Barat.

Research Variables

The independent variable was students' mathematical problem-solving ability with and without the collaborative learning model (X1) and without the collaborative learning model (X2). The dependent variable was students' mathematical problem-solving ability.

Research Type and Design

This study was quantitative (Elfrianto, 2022) with a Pre-Experimental One-Group Pretest-Posttest design (Sugiyono, 2015). The procedure consisted of three stages:

1. Pre-test administration,
2. Treatment with the collaborative learning model,
3. Post-test administration.

Research Instruments

The research instruments included:

1. Observation – to assess student learning activities based on indicators of knowledge, understanding, application, acceptance, and response. Activity scores were categorized from very poor (E) to excellent (A).
2. Test – consisting of multiple-choice questions (10 items, 1 score for each correct answer) administered in the pre-test and post-test.

Instrument Testing

- Validity was tested using the Product Moment correlation; the questions were declared valid if the calculated $r > r_{\text{table}}$ ($\alpha = 0.05$).
- Reliability was calculated using the Cronbach's Alpha formula to determine the consistency of the instrument.
- The Difficulty Index was used to determine easy, medium, or difficult categories.
- Discriminating Power was used to differentiate between upper and lower ability groups of students.

3. RESULTS AND DISCUSSION

After conducting this research, all test results were collected, and the author analyzed each piece of data used in the study. Prior to conducting the study, the researcher first tested the practice test instrument, which consisted of a series of validity and reliability tests. After the overall practice was deemed valid and reliable, the researcher administered a test requiring a 10-question essay-style practice sheet to assess the mathematical problem-solving abilities of students at the UPTD SPF SMP NEGERI 2 PULAU ABANYAK BARAT.

This study used two variables: mathematical problem-solving ability using the collaborative learning method and mathematical problem-solving ability without the collaborative learning model. Based on the data analysis, all data were suitable for data management and analysis. Data interpretation included describing each data set, including information on high scores, low scores, mean, mode, median, and other variables. The following describes basic statistical calculations for each descriptive variable from the pretest-posttest results.

Based on the results of the mathematics problem-solving ability test of students at the SPF Technical Implementation Unit (UPTD SPF) of SMP Negeri 2 Pulau Banyak Barat, the following data was obtained. In the pretest, the lowest score was 30 and the highest was 60. The mean was 50.2, the median was 50, the mode was 50, and the standard deviation was 7.42. Meanwhile, in the posttest after implementing the collaborative learning model, the lowest score was 75 and the highest was 100. The mean was 85.2, the median was 85, and the mode was 80, with a standard deviation of 8.41.

Furthermore, observations using the observation sheet showed that the average student learning activity score was 52.3, or 87%. This score is categorized as "very good," indicating that the mathematics learning process using the collaborative learning model was effective and increased student participation.

The results of the hypothesis test using the t-test showed a calculated t-value of 16.4037, while the t-table value at a significance level of 0.05 was 2.060. Since the calculated t-value $>$ t-table ($16.4037 > 2.060$), it can be concluded that the implementation of the collaborative learning model has a significant effect on students' mathematical problem-solving abilities at the UPTD SPF SMP Negeri 2 Pulau Banyak Barat.

This finding aligns with research by Karimah et al. (2019), which states that collaborative learning methods play a significant role in improving mathematical problem-solving abilities. Similar results were also reported by Purwaaktari (2015), who concluded that the use of the collaborative learning model has a positive and significant effect on students' problem-solving abilities. Therefore, this model can be used by teachers as an alternative to create an active, effective, and engaging learning environment.

4. CONCLUSION

The results of the data analysis yielded the following conclusions:

1. The pretest results showed a mean of 50.2, with a standard deviation of 7.427427. Meanwhile, the posttest results using the collaborative learning model showed a mean of 85.2, with a standard deviation of 8.416254.
2. The results of the hypothesis test showed a large t-value of 16.4037. This means that the calculated t-value is greater than the bold t-value, or $16.4037 > 2.060$. Therefore, it can be concluded that there are learning outcomes in solving mathematics problems for students at the UPTD SPF SMP NEGERI 2 IPU BANYAK BARAT.
3. The collaborative learning model is effective for implementing as a mathematics learning model for students at the UPTD SPF SMP NEGERI 2 IPU BANYAK BARAT.

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