Nusantara Hasana Journal
Volume 5 No. 1 (Juni 2025), Page: 295-301
ISSN : 2798-1428

EFFORTS TO IMPROVE STUDENTS' MATHEMATICAL PROBLEM SOLVING ABILITY BY APPLYING THE GENERATIVE LEARNING TYPE COOPERATIVE MODEL

Antonius KAP Simbolon*[1], Rosmita Sari Siregar[2]

[1,2]Universitas Prima Indonesia

[1]Email: antoniussimbolon@unprimdn.ac.id
[2]Email: rosmitasarisiregar@unprimdn.ac.id

Abstract
The purpose of this study was to determine whether there was an increase in students' mathematical problem solving abilities with the application of the cooperative model of the generative learning type. The type of research is quantitative research with a quasi-experimental method and the design used is pre-experimental. The research sample was students of SMP swasta Bina Sejahtera. Based on the results of the t-test, the t count value = 2.467 and the t-table value = 2.04227 with an α value = 0.05. Then the t count > t table is obtained, namely 2.467> 2.04227, so H0 is rejected. This means that the application of the generative learning model is effective based on the average posttest value of students' mathematical problem solving abilities in social arithmetic material.
Keywords : *Generative Learning; operational model; Mathematical Problem-Solving*

INTRODUCTION

Mathematics is a science that plays an important role in everyday life. According to Savitri (2017) mathematics is a basic science that supports the advancement of science and technology. In addition, according to Suherman (in Mukhtasar et al., 2018) mathematics has three functions, including as 1) a tool for understanding and conveying information, for example the use of tables or mathematical models to change story problems or mathematical descriptive problems to be simpler; 2) efforts to construct thought patterns in understanding a concept or in reasoning to see the relationship between the concepts; and 3) science, where mathematics always seeks the truth and tries to develop discoveries by following the right rules. Therefore, the role and function of mathematics are a concern in mathematics learning. Based on its type, mathematical ability can be classified into five main competencies , namely: 1) mathematical understanding , 2) mathematical problem solving, 3) mathematical communication, 4) mathematical connection, and 5) mathematical reasoning (Hendriana & Soemarmo, 2017).

Of the several types of mathematical abilities that have been described, one of the abilities that students must have is the ability to solve mathematical problems. According to Putri, et al. (Iswara & Sundayana, 2021) problem solving is a process of finding solutions in facing difficulties in order to achieve learning goals. In mathematics learning, problem solving emphasizes the use of methods, procedures, and strategies that can be proven systematically (Rahmmatiya & Miatun, 2020).

In the process of learning mathematics, problem-solving skills need to be prioritized, because by facing problems, students will be encouraged to think

intensively and creatively in solving the problems they face. This is in line with Lester's opinion (Anggo, 2011) that the main purpose of teaching problem solving in mathematics is not only to equip students with a set of skills or processes, but it is necessary for students to think about what they think. Thinking about what is thought in this case is related to students' awareness of their ability to develop various possible ways to solve problems.

In line with the opinion of Poehkonen (Siswono, 2016; Rahmmatiya & Miatun, 2020) stated that mathematical problem solving skills are very important for every student to improve thinking skills and also be a motivation for students in learning mathematics. In addition, mathematical problem solving skills also motivate students to use concepts and strategies in solving the problems given.

Furthermore, Niskayuna (Amam, 2017) classifies problem solving into three interpretations, namely: 1) problem solving as an approach, meaning that the beginning of learning is faced with a problem, 2) problem solving as a goal , this is related to what is expected and the purpose of learning mathematics, and 3) Problem solving as a process, namely activities that emphasize the strategy that will be carried out in working on problems so as to find the appropriate answer. Mathematical problem solving has a very important or meaningful role when learning mathematics. In line with Branca's opinion (Hendriana & Soemarmo, 2017) states that problem solving has two meanings, namely as an approach and a process of learning mathematics. Students who have mathematical problem solving skills are students who can solve problems in mathematics based on predetermined steps. The steps for solving problems according to Polya (Hendriana and Soemarmo, 2017) are:

1. Problem understanding activity. In this activity, students identify problems starting from available or known data, unknown data, and problem conditions.
2. The activity of planning or designing a problem-solving strategy. In this activity, students identify questions such as whether the question is similar to previous questions that have been worked on, and determine what theory or method is appropriate to solve the problem.
3. Calculation implementation activities. In this activity, students carry out or implement the chosen strategic plan and carry out calculations and check the correctness of each step in working on the problem.
4. Rechecking activity. In this activity, students recheck the answers obtained, find out whether the problem can be found in another way, and whether the results or methods used can be used for other problems.

Based on the problem-solving steps, it is expected that students will be able to solve problems in mathematics learning using the right steps, but in fact, many students still have difficulty solving problems. Based on the results of research conducted by Purnamasari and Setiawan (2019), it shows that students do not master the stages of working on questions. The difficulties experienced by students in solving problems occur due to low problem-solving abilities. Based on research conducted by Sriwahyuni and Maryati (2022), it was stated that students have difficulty solving problems because they think that mathematics is difficult and have not mastered the steps that must be used in solving mathematical problems, especially in determining strategies for solving problems and re-checking the results or answers obtained.

In the learning process, Polyan (Hendriana & Soemarmo, 2017) put

Nusantara Hasana Journal
Volume 5 No. 1 (Juni 2025), Page: 295-301
ISSN : 2798-1428

forward suggestions to help overcome students who experience difficulties, namely: 1) ask questions to direct students to work, 2) provide clues to solve problems, 3) help students to deepen their knowledge and ask their own questions according to the needs of the problem, and 4) help students overcome their own difficulties. From this statement, teachers play an important role in reducing the occurrence of difficulties in learning that arise due to low problem-solving abilities. One alternative is to use a supportive learning model so that learning objectives can be achieved. One of the learning models that can improve students' mathematical problem-solving abilities is the cooperative generative learning model. The cooperative generative learning model is a constructivist learning model. This learning model emphasizes more on actively integrating new knowledge by using knowledge that students already have (Aulia, 2018). Osborne and Cosgrove (Sutarman & Swasno; Anzar, et al., 2019) the learning stages using the cooperative generative learning model consist of preliminary stages (exploration), focusing, challenges, and application of concepts. By using the learning stages, students can develop and improve their mathematical abilities, namely problem-solving abilities. At the concept application stage, students are invited to solve a problem with the theory or concept that has been explained. The problem-solving process given must be in accordance with the indicators of problem-solving abilities. Generative learning (cooperative type generative learning model) was first introduced by Osborne and Cosgrove (Wena, 2010; Qonaah, et al., 2019). The cooperative generative learning model can be interpreted as a learning model that emphasizes the affective interpretation of new knowledge by using the knowledge that students already have. Osborne and Cosgrove (Sutarman & Swasno; Anzar, et al., 2019) state several stages of generative learning, namely:

1. Preliminary stage (exploration). In the preliminary stage, the teacher provides a stimulus to explore knowledge, ideas or an initial concept obtained from knowledge that has been learned or at the previous grade level or can also be obtained from daily experiences related to the material being taught. The stimulus given by the teacher is an assignment in the form of tracing a problem that can show a situation related to the concept of the material to be studied. With these conditions, it is expected that students have a sense of curiosity so that questions arise as to why this can happen and then it can be a motivation for students to discuss a situation.
2. Focusing stage. At this stage the teacher acts as a facilitator where students complete the task by means of group discussion. By using the concept of understanding the material in the previous stage.
3. Challenge stage. The challenge stage is also known as the concept introduction stage. Where students who have had discussions then draw conclusions and make presentations related to what has been discussed so that they can exchange opinions and experiences with other groups.
4. Concept application stage. This stage is the last stage, students are invited to solve problems with new concepts that have been learned. At this stage, the teacher gives more practice questions so that students understand the concept deeply and meaningfully.

One of the advantages of the cooperative model of the *generative learning type* is that it makes students more actively involved in learning, especially in

activities discussing ideas or understanding certain concepts (Yenni & Andriani, 2019). The generative learning model can also guide students in constructing meaning based on existing information.

Implementation of the cooperative model of the generative learning type with group division. Group division has been arranged with various abilities ranging from low to high. The activities carried out in learning are the exploration stage, students are given problems related to everyday life to find out the initial concepts that students have. Focusing stage, students solve problems in groups. Challenge stage, students draw conclusions. And the application stage, students solve problems using new concepts. Seeing this, the researcher assumes that the application of the generative learning model is effective for students' mathematical problem-solving abilities .

METHOD

The type of research conducted is quantitative research. According to Kasiram, quantitative research is a process of finding knowledge that uses numerical data to analyze details about what we want to know (Djollong, 2014). The design in this study is pre-experimental design. The type of experimental design is one-group pretest-posttest research design. According to Sugiyono (Aslami, et al., 2019) states the research pattern of the one-group pretest-posttest research design method as follows:

Information:
O = Pretest Score (before treatment)
X = Treatment (use of *cooperative type generative learning model*)
O = Posttest value (after treatment)

The population of this study were students of grade VII of SMP swasta Bina Sejahtera in Medan with the academic year of 2023/2024. These grade VII students will be given an experiment of generative learning model with a total of 32 students.

Researchers use the types of test instruments, namely essay test question sheets and observation sheets. The instrument in the form of test questions is used to measure students' mathematical problem solving abilities, where the test used is in the form of descriptive questions that are in accordance with the indicators of mathematical problem solving abilities and this test is given in the initial test and final test. And the observation sheet is used to see the implementation of learning by applying the cooperative model of the *generative learning type* .

The data obtained from the results of the students' mathematical problem solving ability test were processed to determine whether the use of the generative learning cooperative model was effective or not. The analysis carried out in this study was descriptive and inferential analysis. Inferential analysis through normality test, one treatment t-test.

RESULTS AND DISCUSSION

The results of the study include pretest results and posttest results. The results were processed statistically with the following results:

Table 1. Pretest and Posttest Results

Nusantara Hasana Journal
Volume 5 No. 1 (Juni 2025), Page: 295-301
ISSN : 2798-1428

Information	Pretest	Posttest
Smallest score	20	75
Biggest score	50	95
Standard deviation	1,235	2,347
Average	35	85

Based on Table 1, it can be seen that the number of students participating in the pretest was 32 people with an ideal score of 70. The average value of mathematical problem solving ability before being given the experiment of applying the *generative learning type cooperative model* was 35 with a standard deviation of 1.235. The highest score obtained by one of the students was 50 and the lowest score obtained was 20. While for the results after the application of the model, the average obtained by students 4 afternoon taxation B after receiving treatment, namely the application of the *generative learning type cooperative model* was 85 with a standard deviation of 2.347. And one of the students got the lowest score was 75 and the highest score was 95.

Table 2. Mathematics Learning Completion

Interpretation	Frequency	Presentation
Not finished	2	6.25%
Completed	30	93.75%

From Table 2, it is concluded that the mathematical problem solving ability after the implementation of the cooperative model of the generative learning type is 93.75% or 30 students have completed and 6.25% or 2 students are declared incomplete. The minimum completeness value is 75.

Furthermore, hypothesis testing was carried out using a single-treatment t-test and z-proportion test, to determine the application of the cooperative model of the generative learning type effectively towards students' mathematical problem-solving abilities. According to Kistiano (Asbiyati, et al., 2018), an effective indicator is that student learning outcomes are said to be classically complete if students experience individual completeness of at least 75%, meaning that students can absorb 75% of the material. Before testing the hypothesis, a data normality test was carried out as a prerequisite test. Based on the normality test (Liliefors test), the value of L_{max} was 0.124 and L_{table} 0.153, so $L_{max} \leq L_{table}$ so that the posttest data was normally distributed.

Based on the results of the inferential analysis of the one-treatment t-test on data processing, the calculated $t_{value} = 2.467$ and the table $t_{value} = 2.04227$ with an α value = 0.05. Then the calculated $t > t_{table}$ is $2.467 > 2.04227$, so H_0 is rejected. This means that the application of the generative learning model is effective based on the average posttest value of students' mathematical problem solving abilities.

From the results of the hypothesis testing, it can be concluded that the application of the generative learning cooperative model is effective. This means that the generative learning cooperative model can be used as an alternative in learning mathematics, especially for students' mathematical problem-solving abilities. These results are supported by research conducted by Maryanti, Sakinah, & Situmorang (2022) which shows that the generative learning model has an effect on the quality of student learning.

Furthermore, research conducted by Khotimah and Wardani (2020) obtained results that the generative learning model has a significant influence on

student learning outcomes as indicated by an average of 85. And research conducted by Zulfa (2022) obtained results that generative learning is more effective than direct learning models (expository) on students' mathematical reasoning abilities in social arithmetic material.

CONCLUSION

Based on the results and discussions above that have been described, it can be concluded that the application of the cooperative type generative learning model is effective in improving students' mathematical problem solving abilities in social arithmetic material .

BIBLIOGRAPHY

Amam, A. (2017). Assessment of Junior High School Students' Mathematical Problem Solving Ability. Teorema: Mathematical Theory and Research, 2(1), 39-46.

Anggo, M. (2011). Metacognition Involvement in Mathematical Problem Solving. Edumatica, 1(1), 29-42.

Anzar, Z., Arvyaty., Busnawir., & Fahinu. (2019). The Influence of Generative Learning Model on the Ability to Understand Mathematical Concepts of Class VIII Students of SMP Negeri 12 Kendari. Journal of Mathematics Education, 10(1), 43-54.

Asbiyati, F., Murboyono, R., & Aprizal (2018). The Effectiveness of Numbered Heads Together Learning Model on Concept Understanding in Economics Subject at SMAN 6 Jambi City. Thesis. Jambi: University of Jambi.

Aslami, AD, Aniq, MKHB, & Endah, D. (2019). The Effectiveness of the Talking Stick Type Cooperative Learning Model on Mathematics Learning Outcomes. Indonesian Journal of Education Research and Review, 2(3), 363-373.

Aulia, D. (2018). Effectiveness of Applying Generative Learning Model on Mathematical Reasoning Ability of Class VIII Students of SMP Negeri 14 Palopo. Proceedings of National Seminar, 3(1), 65-71.

Djollong, AF (2014). Quantitative Research Implementation Techniques. Istiqra: Journal of Islamic Education and Thought, 2(1), 86-100.

Hendriana, H., and Soemarmo, U. (2017). Assessment of Mathematics Learning. Bandung: Refika Aditama.

Iswara, E., & Sundayana, R. (2021). Application of Problem Posing and Direct Instruction Learning Models in Improving Students' Mathematical Problem Solving Skills. Plusminus: Journal of Mathematics Education, 1(2), 223-234.

Lestari, S., Andinasari., & Retta, AM (2020). Generative Learning Model to Improve Students' Mathematical Representation Ability. IndoMath: Indonesia Mathematics Education, 3(1), 44-51.

Maryanti, I. & Yusa, F. (2021). The Influence of the Generative Learning Model on the Quality of Mathematics Learning at SMP Muhammadiyah 05 Medan Academic Year 2020/2021. Somasi Journal (Social Humanities Communication), 2(1), 87-91.

Maryanti, I., Sakinah., N. & Situmorang, HF (2022). The Influence of Generative Learning Model on Learning Quality. Journal of Elementary, Secondary,

and Higher Education Management (JMP-DMT), 3(3), 105-113.
Purnamasari, I., & Setiawan, W. (2019). Mathematical Problem Solving Ability of Junior High School Students on SPLDV Material Reviewed from Initial Mathematical Ability (KAM). Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang, 3(2), 207-215.
Qonaah, A., Pujiastuti, H., & Fatah, A. (2019). The Effect of Generative Learning Model on Improving Mathematical Communication Skills Reviewed from Students' Initial Mathematical Abilities. Edumatica: Journal of Mathematics Education, 9(1), 9-14.
Rahmmatiya, R. & Miatun, A. (2020). Analysis of Mathematical Problem Solving Ability Reviewed from the Mathematical Resilience of Junior High School Students. Teorema: Mathematical Theory and Research, 5(2), 187-202.
Savitri, Intan Ramia. 2017. *Students' Thinking Process in Solving Linear Program Story Problems Reviewed from Mathematical Ability*. Unpublished thesis. Surabaya: PPs Surabaya State University.
Sriwahyuni, K., & Maryati, I. (2022). Students' Mathematical Problem Solving Ability in Statistics Material. Plusminus: Journal of Mathematics Education, 2(2), 335-344.
Sumartini, TS (2016). Improving Students' Mathematical Problem Solving Ability Through Problem-Based Learning. Mosharafa: Journal of Mathematics Education, 5(2), 148-158.
Yenni, Y., & Andriyani, R. (2019). Statistics Teaching Materials Based on Generative Learning to Improve Mathematical Understanding Skills. Kalamatika: Journal of Mathematics Education, 4(2), 151-162.