COLLABORATIVE GROUP MENTORING STRATEGIES TO IMPROVE JUNIOR HIGH SCHOOL STUDENTS' MATHEMATICAL PROBLEM-SOLVING ABILITIES

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ABSTRACT

The ability to solve mathematical problems is essential for junior high school students, yet many still struggle to understand concepts deeply and tend to memorize formulas without grasping their meaning or application. This condition weakens students' critical and creative thinking skills. This study aims to evaluate the effectiveness of a collaborative group mentoring strategy for eighth-grade students through a two-cycle Classroom Action Research (CAR) design. Data were collected through observations and interviews, then analyzed descriptively. The findings show that the collaborative group mentoring strategy improves students' conceptual understanding, participation, and critical and creative thinking skills. The collaborative learning environment also enhances student motivation. Thus, this strategy is effective for improving mathematical problem-solving skills in accordance with the 2013 Curriculum.

Keywords*Collaborative Mentoring, Problem Solving, Mathematics Learning*.

INTRODUCTION

Problem-solving skills in mathematics are fundamental skills that are a major focus in modern mathematics learning standards. In practice, this ability not only focuses on solving problems procedurally, but also requires critical, analytical, and creative thinking processes in finding the best solution to a problem. The National Council of Mathematics (NCTM) emphasizes that problem-solving is included in the five main components of mathematics learning, along with aspects of reasoning and proof, communication, connection, and representation (IJe3; Padang State University Journal). This shows that strengthening problem-solving skills is very important to be instilled in students, especially at the junior high school (SMP) level, which is a transitional phase from basic mathematics learning to more complex concepts.

However, the reality in schools shows that junior high school students' mathematical problem-solving abilities have not yet achieved the desired results. Many students face obstacles in understanding problems, developing solution strategies, and presenting answers coherently and systematically. These obstacles are influenced not only by limited mastery of mathematical concepts but also by students' limited experience working on problems that require higher-order thinking skills. Furthermore, the mathematics learning process in the classroom tends to be teacher-centered and dominated by conventional material delivery, leaving students in a passive role as recipients of information. This condition results in students receiving fewer opportunities to develop critical and creative

thinking patterns in dealing with complex mathematical problems or those based on real-life contexts.

This situation is further complicated by the limited application of learning strategies that meet students' needs in developing problem-solving skills. One approach considered effective in addressing this challenge is the collaborative group mentoring strategy. Collaborative group mentoring is a form of learning that emphasizes collaboration among students in small groups to collectively complete assignments and problems. Through this approach, students are facilitated to discuss, exchange ideas, and help each other understand concepts and find solutions to given problems. This allows the learning process to be more interactive, actively engage students, and provide a more meaningful learning experience.

The implementation of collaborative group mentoring strategies is believed to positively contribute to improving junior high school students' mathematical problem-solving abilities. First, the social interactions established within the group can stimulate the development of mathematical communication skills, both verbally and in writing. Second, through discussion activities, students have the opportunity to understand problems from various perspectives, thereby enriching their thinking and developing alternative problem-solving strategies. Third, the mentoring role of teachers or facilitators within the group helps students experiencing difficulties stay focused and avoid feeling like they are working alone in the learning process. Fourth, a cooperative learning environment can foster motivation and increase students' self-confidence in facing mathematical problems.

The collaborative group mentoring strategy aligns with the mathematics learning principles proposed by NCTM, which emphasize the importance of communication, connection, and representation in the learning process. Through collaborative activities, students not only practice solving mathematical problems but also hone their ability to effectively convey mathematical ideas, relate learned concepts to real-world situations, and present solutions in various presentation formats such as graphs, tables, diagrams, and mathematical symbols. These skills are crucial for preparing students to face the demands of 21st-century competencies that require critical thinking, creativity, collaboration, and communication skills.

However, the implementation of collaborative group mentoring strategies in mathematics learning at the junior high school level still faces several obstacles. These challenges include limited learning time allocation, differences in academic ability levels among students in each group, and teachers' limited experience in optimally managing collaborative learning processes. Furthermore, not all students have sufficient motivation or social skills to actively participate in group work. Therefore, planned and ongoing steps are needed to maximize the effectiveness of this strategy, such as through teacher training, the development of relevant learning materials, and the implementation of regular monitoring and evaluation of student learning processes and outcomes.

Based on the explanation presented, this research focuses on a collaborative group mentoring approach in mathematics learning, specifically in the context of problem-solving

at the junior high school level. The primary objective of this research is to improve student skills and significantly impact the development of theory and practice in more responsive mathematics education.

RESEARCH/EXPERIMENTAL METHODS

This research used the Classroom Action Research (CAR) model, implemented in two cycles. Each cycle includes planning, implementation, observation, and reflection. This model was chosen because it allows teachers to systematically and continuously improve learning practices through ongoing evaluation of implemented actions.

1. Research Design

   The research design follows the Kemmis and McTaggart PTK framework which includes four main stages as follows:

   a. Planning

      In the initial stage, researchers prepared learning materials such as lesson plans, group activity sheets, collaborative mentoring implementation guidelines, and observation and interview instruments. Furthermore, researchers determined group assignments by considering the diversity of student abilities to create heterogeneous groups conducive to collaborative learning.

   b. Acting

      Teachers implement collaborative group mentoring strategies in math problem-solving activities. Each group is given a problem to analyze and solve together, then supported through scaffolding, guided discussions, role assignments, and post-activity reflection sessions.

   c. Observation

      During the intervention, researchers and collaborators observed student activities, group contributions, critical and creative thinking skills, and problem-solving skills. Observations were conducted using instruments that included cognitive, affective, and collaborative aspects.

   d. Reflection

      Observation and interview results were analyzed to determine the level of success of the actions and any obstacles that emerged in each cycle. These findings were used as a basis for improvements in the implementation of the actions in the next cycle.

2. Research Subjects and Locations

   The research was conducted at a public junior high school during the even semester of the current academic year. The subjects were 6 out of 25 eighth-grade students.

Subject selection was conducted purposively, taking into account the need to improve problem-solving skills and the class' readiness for collaborative learning.

3. Collaborative Group Mentoring Strategy

   The collaborative group mentoring strategy implemented includes several components, namely:

   - Division of roles within the group, such as leader, questioner, note taker, and presenter.
   - Gradual scaffolding, in the form of guiding questions, concept explanations, and support for the thinking process.
   - Structured discussions, starting from discussions in small groups to discussions between groups to validate understanding.
   - Group reflection, to examine strengths and weaknesses during the work process.
   - Cyclical mentoring, namely guidance provided at each stage of problem solving.

   This approach is designed to increase interaction between students, foster a sense of shared responsibility, and strengthen collective understanding of concepts.

4. Data collection technique

   a. Observation of student activities

      Observations were conducted using assessment sheets that covered aspects of group involvement, mathematical communication, critical and creative thinking skills, and learning independence.

   b. Interview

      Semi-structured interviews were conducted with students and teachers to explore their learning experiences, motivations, and views on collaborative mentoring strategies.

5. Data Analysis Techniques

   Data analysis was carried out using a qualitative descriptive approach through three main steps:

   a. Data reduction, namely selecting, filtering, and grouping data based on the research focus.
   b. Presentation of data, in the form of narrative descriptions, tables, or graphs to illustrate the developments that occur.
   c. Drawing conclusions, namely analyzing changes in learning behavior, quality of collaboration, and improvement in problem-solving abilities from the first cycle to the second cycle.

RESULTS AND DISCUSSION

This study aims to examine the extent to which collaborative group mentoring strategies can improve mathematical problem-solving skills in junior high school students. The study involved 29 students as subjects, using a quasi-experimental design with a one-group pretest-posttest model. The problem-solving ability test instrument was administered before and after the implementation of the learning strategy to observe changes in students' overall abilities. The study was conducted in four meetings. The problem-solving ability test was administered before and after the treatment. The indicators assessed were:

a. Understanding the problem
b. Planning a strategy
c. Implementing a resolution strategy
d. Re-evaluate the results

1. Problem Solving Ability Test Results

Test Types	**Average**	**Category**
Pretest	54.37	Not enough
Posttest	78.62	Good

There was an increase of 24.25 points, indicating significant changes academically and pedagogically.

2. Student Activities during Learning

   Student activities are observed at every meeting and continue to show improvement, especially in:

   a. Enthusiastic in discussion
   b. Courage to express opinions
   c.
   d. Responsibility for completing group assignments

3. Student Response
   Most students responded positively to collaborative group mentoring strategies, including: 1) Learning became more enjoyable. 2) They weren't afraid of making mistakes because they were supported by each other. 3) They understood problem-solving steps better.

The results of the study revealed that the implementation of collaborative group mentoring strategies had a positive and significant influence on improving the mathematical problem-solving abilities of junior high school students.

CONCLUSION

The research revealed that the implementation of mentoring strategies in collaborative groups contributed positively and significantly to improving junior high school students' mathematical problem-solving abilities. This impact was evident not only in test scores but also in the progress in students' thinking and learning dynamics throughout the learning process. The success of this strategy implementation is inseparable from several key factors, namely:

a. The existence of group discussion activities that provide space for students to exchange ideas and build understanding through interaction,
b. The role of the teacher as a companion who provides emotional and academic support creates a sense of security in learning, increases self-confidence, and stimulates independent thinking, and
c. The involvement of social and emotional aspects encourages students to communicate politely, respect the views of friends, actively participate in group assignments, and be responsible for shared achievements.

The collaborative group mentoring strategy creates an interactive, dialogic, and supportive learning environment, helping students improve their problem understanding, design solutions, perform calculations accurately, and review their work. Therefore, this strategy is recommended as a mathematics learning approach at the junior high school level to optimize students' problem-solving abilities.

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