Muhran, Holten Sion, Sri Endang Mugi Rahayu, Netto W.S. Rahan, Kuswari, Abdul Rahman Azahari. Problem-solving methods influencing mathematics learning outcomes of elementary school students in Palangka Raya. Acta Scientiae et Intellectus, 7(2); 2021, 33-43.

PROBLEM-SOLVING METHODS INFLUENCING MATHEMATICS LEARNING OUTCOMES OF ELEMENTARY SCHOOL STUDENTS IN PALANGKA RAYA

Muhran[1], Holten Sion[2], Sri Endang Mugi Rahayu[2], Netto W.S. Rahan[2], Kuswari[2], Abdul Rahman Azahari[2]

[1]Master of Education, Postgraduate Program,
[2]Department of Education, Faculty of Teacher Training and Education, Palangka Raya University, Palangka Raya, ***INDONESIA***

ABSTRACT

The problem-solving method has advantages, especially it can make school education more relevant to life, the teaching and learning process through problem-solving can accustom students to face and solve problems skillfully. This method stimulates the development of students' thinking abilities creatively and thoroughly because in the learning process students do a lot of mental action by highlighting problems from various aspects to find solutions. The application of the problem-solving method makes students more skilled in solving problems related to math problems. Problem-solving methods will also help students understand because they relate to everyday life. Students can also practice their numeracy skills based on correct mathematical concepts when solving problems because students learn based on a systematic process. Also, students are facilitated to work together in groups and respect other people's opinions when solving problems, and foster motivation to learn. Problem-solving methods can have a significant effect on student mathematics learning outcomes.

Keywords: *problem-solving, method, student, mathematics learning, outcomes*

INTRODUCTION

Mathematics subjects need to be given to all students starting from elementary schools to equip students with the ability to think logically, analytically, systematically, critically, and creatively, and the ability to work together (Permendiknas, Number 22, 2006). This ability is needed so that students

can have the ability to acquire, manage, and use the information to survive in ever-changing, uncertain, and competitive conditions. The general objectives of learning mathematics areas formulated in these regulations, namely: (1) understanding mathematical concepts, explaining the relationship between concepts, and applying concepts or algorithms, in a flexible, accurate, efficient, and precise manner in solving problems; (2) using reasoning on patterns and properties, performing mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; (3) solving problems with the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained; (4) communicating ideas with symbols, tables, diagrams, or other media to clarify the situation or problem; and (5) having an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention, and interest in learning mathematics, as well as being resilient and confident in problem-solving. Learning is a process of interaction between students and teachers and learning resources in a learning environment. A good learning environment is an environment that triggers and challenges learners to learn. Learning objectives are the abilities possessed by students after gaining learning experiences. Mastery of these abilities is nothing but the desired learning outcomes.

Learning mathematics is a sufficient condition to continue education to the next level. Because by learning mathematics we will learn to reason critically, creatively, and actively. Mathematics is abstract ideas that contain symbols, so mathematical concepts must be understood before manipulating those symbols. psychomotor as a result of learning activities. Learning outcomes are abilities that students acquire after going through learning activities. There are four pillars of learning outcomes that are expected to be achieved by educators, namely learning to know, learning to be, learning to live together, and learning to do. The word results in Indonesian means the acquisition of an effort that has been done before. Student learning outcomes can be expressed by grades or report cards as the last formulation of the teacher regarding the progress or learning outcomes of students in a certain period.

The problem-solving method is the use of methods in learning activities by training students to face various problems, be it personal or individual problems or group problems to be solved alone or collectively. Problem-solving is the process of accepting challenges and efforts to solve them until finding solutions. The problem-solving method is not just a teaching method but also a method of thinking, because in problem-solving you can use other methods, starting from looking for data to concluding (Ludang, 2010; Ludang et al., 2011; Sion, 2016). Furthermore, learning outcomes are abilities that students acquire after going through learning activities. Student learning outcomes can be expressed by grades

or report cards as the last formulation of the teacher regarding the progress or learning outcomes of students in a certain period. The reason for this research is that mathematics is often considered a very difficult and boring subject. Based on observations, it is found that in learning mathematics the teacher has used various methods, including lectures, discussions, exercises. However, this method has not been developed optimally so that students feel bored and bored so that student learning outcomes are not optimal. Therefore, this study focuses on problem-solving-based learning problems, specifically for mathematics lessons, which are given to elementary school students.

PROBLEM-SOLVING METHOD

Understanding

The problem-solving method is the use of methods in learning activities by training students to face various problems, be it personal or individual problems or group problems to be solved alone or collectively. Problem-solving is the process of accepting challenges and efforts to solve problems. finish it until it finds a solution. according to Syaiful Bahri Djamara (2006) that:

The problem-solving method (problem-solving method) is not just a teaching method but also a method of thinking, because in problem-solving you can use other methods starting from looking for data to concluding. According to Sukirman (2009), the problem-solving method is a way of presenting learning material by making the problem a starting point for discussion to be analyzed and synthesized to find solutions or answers by students. Thus problem-solving is a method that teaches problem-solving by emphasizing the solving of a problem logically.

In problem-solving methods, the subject matter is not limited to books but also comes from certain events following the applicable curriculum. There are several criteria for selecting learning materials for problem-solving methods, namely:

a. Contain issues that contain conflict bias from news, video recordings, and others.
b. Are familiar with students.
c. Relating to the interests of many people.
d. Support the goals or competencies that students must have according to the applicable curriculum.
e. By student interests so that students feel the need to learn.

In the implementation of daily learning, the problem-solving method is widely used by the teacher along with the use of other methods. With this method, the teacher does not provide information first but the information is obtained by students after solving the problem. Problem-solving learning departs from problems that must be solved through practicum or observation.

A problem can be viewed as a "problem" is a very relative thing. A problem that is considered a problem for someone, for others it may just be a routine matter. Thus, teachers need to be careful in determining the questions to be presented as problem-solving. For most teachers to get or arrange questions that are not a routine problem for students may be a difficult job. However, this can be overcome, among others, through experience in presenting various questions in terms of form, problem theme, difficulty level, and demands for intellectual abilities to be achieved or developed in students.

Problem-solving learning is part of problem-based learning. Problem-based learning is a learning approach in which students work on authentic problems to compile their knowledge. In problem-based learning, students are required to solve the problems presented by digging up as much information as possible, then analyzing and finding solutions to existing problems. The solution to these problems does not have one correct answer, meaning that students are also required to learn critically. Students are expected to become individuals who are broad-minded and able to see the relationship of learning with the aspects that exist in their environment.

From the above point of view, it can be concluded that the problem-solving learning method is a presentation of subject matter that exposes students to problems that must be solved or resolved to achieve learning objectives. In this learning, students are required to carry out authentic investigations to find solutions to the problems given. They analyze and identify problems, develop hypotheses, collect and analyze information and make conclusions.

Benefits and Purpose

The benefits of using problem-solving methods in the teaching and learning process are to develop more interesting learning. Problem-solving methods provide several benefits, including:

a. Developing students' attitude skills in solving problems, and in making decisions objectively and independently.
b. Developing the thinking abilities of students, the assumption that the ability to think will be born when knowledge increases.
c. Through inquiry or problem solving, the thinking ability is processed in situations or situations that are lived, in demand by students, and a variety of alternatives.
d. Fostering the development of an attitude of feeling (want to know more) and an objective way of thinking - independently, crisis - analysis, both individually and in groups.

The success or failure of teaching depends on a goal to be achieved. The objectives of problem-solving learning are as follows.

a. Students become skilled at selecting relevant information then analyzing it and finally re-examining the results.
b. Intellectual satisfaction will arise from within as an intrinsic gift to students.
c. The intellectual potential of students increases.
d. Students learn how to make discoveries by going through the process of making discoveries.

Steps

The ability to make alternative solutions to skills by taking into account the consequences of each choice. Problem-solving according to David Johnson and Johnson can be done through groups with the procedure for solving it as follows:

1. Defining the Problem

Defining the problem in the class can be done as follows:

a). Bring up the problematic events to students, either through written material or orally, then ask students to formulate the problem in one simple sentence (brainstorming). Capture each of their opinions by writing them on the board without questioning whether or not they are right or wrong.

b). Each opinion is reviewed with a request for an explanation from the student concerned. Thus, some of the less relevant formulas can be written off. The appropriate formulation is chosen, or formulated (rephrase, restate) inaccurate formulations. In the end, the class chooses the most appropriate formula used by all.

2. Diagnose the problem

After successfully formulating the problem the next step is to form a small group, this group that will discuss the causes of the problem

3. Formulating Strategy Alternatives

At this stage, the group looks for and finds various alternatives on how to solve the problem. For this reason, the group must be creative, think divergent, understand the contradiction between various ideas, and have high discoverability

4. Determine and implement a strategy

After various alternatives have been found by the group, then which alternative will be chosen to be used. In this stage, the group uses considerations that are quite critical, selective, with co-operative thinking

5. Evaluating the Success of the Strategy

In this final step the group studies:

a) Did the strategy work (process evaluation)?
b) What are the consequences of implementing the strategy (evaluation of results)?

Based on the opinion of experts, it can be concluded that the steps that must be considered by the teacher in providing problem-solving learning are as follows:

a) Formulate the problem: In formulating the problem, the required ability is the ability to know and formulate a problem.
b) Examining the problem: In examining the problem, the required ability is to analyze and detail the problem being studied from various angles.
c) Collect and classify data as material to prove the hypothesis: Collecting and classifying data is displaying data in the form of charts, pictures, etc. as material to prove a hypothesis.
d) Proof of hypothesis: In proving the hypothesis the required ability is the ability to analyze and discuss the data that has been collected.
e) Determine problem-solving options and decisions: In determining problem-solving options and decisions, the skills needed are the skills to make alternative solutions, choose alternative solutions, and decision-making skills.

Advantages and disadvantages

This problem-solving learning has advantages and disadvantages. The advantages of problem-solving learning models include training students to design an invention, think and act creatively, solve problems faced realistically, identify and carry out investigations, interpret and evaluate observations, stimulate the development of student thinking progress to solve problems faced by appropriate, and can make school education more relevant to life, especially the world of work.

While the weaknesses of the problem-solving learning model itself, such as several subjects, are very difficult to apply this method. For example, the limited laboratory equipment makes it difficult for students to see and observe and finally can conclude the event or concept. In problem-solving learning, it requires a longer time allocation compared to other learning methods.

PRIMARY SCHOOL MATHEMATICS LEARNING

Mathematics

Nasution in Karso, et al (2010) states that the term mathematics comes from the Greek language, namely mathein or manthenein which means learning, but it is suspected that the word is closely related to Sanskrit, namely medha or widya which means intelligence, being known, or intelligence. According to Ruseffendi in Karso, et al (2010), “mathematics is organized from undefined elements, definitions, axioms, and arguments, where the arguments after being proven true general, that's why mathematics is often called a deductive science”.

Susanto (2013) says that “mathematics is one of the disciplines that can improve thinking and argumentation skills, contribute to solving everyday problems in the world of work, and provide support in the development of science and technology”.

Furthermore, Fathani (2009) describes the general definition of mathematics as follows:

1) Mathematics as an organized structure, which consists of several components including axioms/postulates, basic/primitive notions, and postulates/theorems.
2) Mathematics as a tool, namely as a tool in finding solutions to various problems in everyday life.
3) Mathematics as a deductive mindset, that is, a theory or statement in mathematics can be accepted as true if it has been proven deductively (generally).
4) Mathematics as a way of reasoning, which contains valid methods of proof, general formulas or rules, or systematic reasoning.
5) Mathematics is an artificial language because the language of mathematics is an artificial language of symbols, which only has meaning when applied to a context.
6) Mathematics is a creative art because it uses logical and efficient reasoning and a vocabulary of creative and amazing ideas and patterns.

Based on these opinions, it can be concluded that mathematics is a scientific discipline consisting of undefined elements, definitions, axioms, and postulates. Mathematics can provide support in the development of science and technology, because of its existence which is part of human life.

Mathematics in Primary Schools

Following Government Regulation Number 32 of 2013, Mathematics is one of the learning content in the curriculum structure of elementary school and equivalent. “Mathematics learning is the process of providing learning experiences to students through a series of planned activities so that students gain competence about the mathematical material being studied” (Muhsetyo et al., 2012). Susanto (2013) says that "learning mathematics is a teaching and learning process that is built by teachers to develop students 'creative thinking which can improve students' thinking skills and can improve the ability to construct new knowledge as an effort to improve good mastery of mathematics”.

Furthermore, Aisyah et al. (2007) state “mathematics learning is a process that is deliberately designed to create an environmental atmosphere that allows students to carry out mathematics learning activities and the process is centered on teachers teaching mathematics”.

Hudojo (2005) describes several things that need to be considered in teaching Mathematics at the elementary level as follows:

1) Students

When teaching mathematics, teachers must pay attention to students' abilities. Students who have moderate abilities need to be introduced to mathematics related to human activities in everyday life. Teachers must be creative in making activities that are suitable for mathematical topics. Students who have high abilities will easily assimilate and accommodate Mathematical theories and problems listed in textbooks.

2) Teacher

There are two teacher orientations in teaching Mathematics in elementary school, namely: (1) Teaching Mathematics by looking at Mathematics theory; and (2) Teaching Mathematics by inviting students to take advantage of the surrounding environment. These two orientations will certainly affect the student learning process.

3) Assistive Devices

Teaching Mathematics in elementary school must begin by showing concrete objects. Gradually by working and observing, students consciously interpret the mathematical patterns contained in the concrete.

4) Learning Process

The teacher is responsible for compiling mathematics material that can make students more active according to the stage of their mental development.

5) Mathematics Presented

The teacher must be able to present a variety of mathematics learning activities by taking into account students' realistic backgrounds.

6) Organizing Class

This form of organizing includes mathematics laboratories, heterogeneous student groups, direct instruction, class discussions, and individual teaching. These things are adjusted to the situation and condition of the students.

Based on these definitions, it can be concluded that mathematics learning in elementary schools is a teaching and learning activity at the elementary school level that is built by teachers with a planned process aimed at obtaining student competence in mathematics.

Learning

Slameto (2010) argues that “learning is a process of the effort carried out by a person to obtain a whole new change in behavior, as a result of his own experience in interaction with his environment”. Furthermore, learning is an important process for changing people's behavior and learning includes everything that someone thinks and does. Learning plays an important role in one's

development, habits, attitudes, beliefs, goals, personality, and even perceptions. Therefore, by mastering the basic concepts of learning, one can understand that learning activities play an important role in the psychological process.

Winkel in Purwanto (2013) suggests that learning is carried out to seek changes in behavior in learning individuals. Changes in behavior are gains that become learning outcomes. This aspect of behavior change refers to the taxonomy of teaching objectives developed by Bloom, Simpson, and Harrow, which includes cognitive, affective, and psychomotor aspects.

Based on these various opinions, it can be concluded that learning is a process that has the effect of changing a person's behavior, which includes cognitive, affective, and psychomotor aspects to be better than before.

Influence factors

Slameto (2010) states that learning activities are influenced by two factors, namely internal and external factors. Internal factors are factors that exist in individuals who are learning. Internal factors include:

(1) Physical consists of health and disability; (2) Psychology consists of intelligence, attention, interests, talents, motives, maturity, and readiness. Intelligence or skills that a person possesses can influence learning; and (3) Fatigue consists of physical and spiritual fatigue. Both can influence learning. So that students can study well they must avoid fatigue.

External factors are factors that exist outside the individual. External factors include: (1) Family, students who learn will receive influence from the family in the form of how parents educate, relationships between family members, household atmosphere, household economic conditions, parental understanding, and cultural background; (2) School, which affects learning activities including teaching methods, curriculum, teacher-student relations, school discipline, school lessons and time, lesson standards, building conditions, learning methods and homework; and (3) Society, is an external factor that affects student learning. This influence occurs because of the existence of students in society. As for things that affect students in society, namely student activities, mass media, socializing, and forms of community life.

Based on Slameto's statement, it can be concluded that the factors that influence learning consist of internal and external factors. Internal factors include physical, psychological, and fatigue. External factors include family, school, and community. The factors that influence learning in this study are the intelligence or skills a person has, in this case, the problem-solving ability.

Learning outcomes

Learning outcomes are abilities that students have after receiving their learning experiences (Sudjana, 2013). Learning outcomes are changes in behavior

obtained by students after experiencing learning activities. Also, it was stated that based on Bloom's taxonomy, learning outcomes include three domains, including cognitive, affective, and psychomotor. The cognitive domain is concerned with intellectual learning outcomes which consist of six aspects, namely knowledge or memory, understanding, application, analysis, synthesis, and evaluation. The affective domain concerning attitudes consists of five aspects, namely acceptance, answers or reactions, assessment, organization, and internalization. The psychomotor domain is concerned with learning outcomes of skills and the ability to act which consists of six aspects, namely reflex movements, basic movement skills, perceptual abilities, harmony or accuracy, complex skill movements, and expressive and interpretive movements.

Based on these definitions, it can be concluded that learning outcomes are the results obtained by a person after experiencing the learning process in the form of three domains, namely cognitive, affective, and psychomotor. The learning outcomes in this study are the results of cognitive learning in Mathematics for grade five students of an elementary school in Palangka Raya as seen from the examination score data for semester II 2019/2020.

CONCLUSION

Problem-solving ability is an indispensable ability to control student learning. We can know the results of student learning, therefore learning mathematics has many benefits for human life, in which there are lessons on addition, multiplication, subtraction, and division, calculating the area of shapes, blocks of spaces, cubes, pyramids, and mathematical formulas. Therefore, learning mathematics with problem-solving methods is very important and necessary, with many benefits.

REFERENCES

1) Aisyah, N., dkk. (2007). Pengembangan Pembelajaran Matematika ELEMENTARY SCHOOL. Jakarta: Direktorat Jenderal Pendidikan Tinggi Departemen Nasional.
2) Fathani, A.H. (2009). Matematika Hakikat & Logika. Yogyakarta: Ar-Ruzz Media.
3) Government Regulation Number 32 of 2013. Peraturan Pemerintah Republik Indonesia Nomor 32 tahun 2013 tentang Perubahan atas Peraturan Pemerintah Nomor 19 Tahun 2005 Standar Nasional Pendidikan.
4) Hudojo, H. (2005). Pengembangan Kurikulum dan Pembelajaran Matematika. Malang: UM Press.

5) Karso, dkk. (2010). Pendidikan Matematika I. Jakarta: Universitas Terbuka. Kemampuan. Online at http://id.wikipedia.org/wiki/Kemampuan (accessed 21/01/2015)
6) Ludang, Y. (2010). A brief review on the role of the community to lessen the rate of global warming. Middle East Journal of Scientific Research, 6(1): 69-75.
7) Ludang, Y.S. Mangkoedihardjo, W. Hadi, S. Jarias (2011). Biodiversity of city phytostructure by incorporating indigenous knowledge for the city of Palangka Raya, Indonesia. International Journal of Academic Research, 3(6): 289-292.
8) Muhsetyo, G. (2010). Pembelajaran Matematika Sekolah Dasar. Jakarta: Universitas Terbuka.
9) Permendiknas, Number 22, 2006. Peraturan Menteri Pendidikan Nasional Nomor 22 tahun 2006 tentang Standar Isi untuk Satuan Pendidikan Dasar dan Menengah.
10) Purwanto (2013). Evaluasi Hasil Belajar. Yogyakarta: Pustaka Pelajar
11) Sion, H. (2016). Hubungan antara Komitmen dan Kepuasan Kerja Guru dengan Performans Mengajar Guru Sekolah Dasar di Daerah Terpencil. Jurnal Ilmu Pendidikan, 13(1): 51-55.
12) Slameto (2015). Belajar dan Faktor-faktor yang Mempengaruhinya. Rineka Cipta, Jakara.
13) Sukirman, dkk. (2009). Matematika. Jakarta: Universitas Terbuka.
14) Susanto, A. (2013). Teori Belajar dan Pembelajaran di Sekolah Dasar. Jakarta: PT.