Improving mathematical problem solving skills through visual media

S A Widodo¹,², Darhim² and T Ikhwanudin²

¹Universitas Sarjanawiyata Tamaniswa, Yogyakarta
²Universitas Pendidikan Indonesia, Bandung

E-mail: sriadi@ustjogja.ac.id

Abstract: The purpose of this article was to find out the enhancement of students' mathematical problem solving by using visual learning media. The ability to solve mathematical problems is the ability possessed by students to solve problems encountered, one of the problem-solving model of Polya. This preliminary study was not to make a model, but it only took a conceptual approach by comparing the various literature of problem-solving skills by linking visual learning media. The results of the study indicated that the use of learning media had not been appropriated so that the ability to solve mathematical problems was not optimal. The inappropriateness of media use was due to the instructional media that was not adapted to the characteristics of the learners. Suggestions that can be given is the need to develop visual media to increase the ability to solve problems.

1. Introduction

The characteristic of mathematics is to have an abstract object [1]. This abstract nature causes many students to have difficulty in math. In fact, many mathematics teachers teach without regard to it. This causes the majority of learners to have negative perceptions of mathematics, such as lazy students and avoid mathematics because mathematics is difficult and complicated [2]. In addition, the low achievement of learning can be attributed to the ability of learners in solving math problems is not adequate because in solving math problems irregular and inconsistent [3]. Student irregularities in solving mathematical problems can be seen from how to solve problems that just write down the answer, while for other stages not done.

In mathematics education, problem-solving is also an important thing to be instilled in students and must be owned by students in learning mathematics [3]. There are several reasons that problem-solving is important and becomes one of the basic skills of a person in solving math problems. First, problem-solving cannot be separated in everyday life, with the ability to solve problems that can be used to provide solutions or answers to problems faced more analytic so that someone can be a problem solver. In other words, when students are trained to solve problems, learners will be able to make decisions because learners have become skilled about how to gather relevant information, analyze information, and be aware of the need to re-examine the results that have been obtained [4].

Secondly, in mathematics learning, problem-solving can be used to formulate concepts, develop ideas or ideas, and capital success for students in solving mathematical problems because a concept or principle will be meaningful if it can be applied in problem-solving [5]. Third, the mathematical standards in schools should include standard content and process standards. Process standards include problem-solving, reasoning and verification, interconnection, communication, and representation [6].
Fourth, one of the objectives of mathematics learning in Indonesia is that students are expected to develop critical, logical, systematic, accurate, effective, and efficient in solving problems [7].

The use of media is one of the many problems in school learning. SMP IPS teachers in Kota Banjarmasin tend to use package books and whiteboards in learning [8]. Even though the learning media is one of the learning tools that must be prepared to support the learning process [9], besides the use of learning media can facilitate communication patterns during the learning process [10].

Learning media can be used to channel messages from the sender (teacher) to the recipient (student) to stimulate the thoughts, feelings, attention or willingness of students so that will encourage the learning process. Because the learning media has a purpose to bring messages or information to the students, the message or information brought by the learning media can be a message that is prepared to meet the learning needs and the ability of students so that students can actively participate in the learning process.

This article aims to discuss the improvement of students' mathematical problem-solving skills by using visual learning media. The ability to solve mathematical problems using the steps of understand the problem, make a plan, carry out our plan, and look back at the completed solution.

2. Method
This study was a preliminary research and did not intend to make a teaching material or model of learning, but only did a conceptual approach prior to a research development. So, the main method carried out was to compare the various literature related to problem-solving ability and associate to learning media.

3. Discussion
3.1 Problem-Solving in Math
The gap that exists between the current situation with the goal to be achieved is one factor the occurrence of the problem. With these problems, we will be required to seek an answer or a solution to the gap. The process of finding such an answer is called problem-solving [11, 4, 12]. Problem-solving is an individual process or effort to respond or overcome obstacles or obstacles when an answer or answer method is not obvious [13]. Problem-solving involves the interaction between a student's (knowledge) scheme with an application process that uses cognitive and affective factors in solving problems [14]. Problem-solving is a high-level mental process and requires a more complex thought process [15]. This is because in solving mathematical problems, one is faced with the concept, skills, and mathematical process to solve mathematical problems [16].

The students 'ability to solve problems is closely related to the students' ability to read and understand the language of the problem, to present and design it in mathematical models, to plan the calculations of the mathematical model, to solve the calculations of the problems encountered, and to interpret the solutions that have been obtained [17, 18, 19]. Achieving the ability to solve mathematics requires the obedience (demands) of learners in using the steps to solve the problem. If students are not coherent in solving the problem can be ascertained that the ability of learners is not satisfactory, so that student achievement becomes low. As expressed by [17] problem-solving ability is an effort or way student in solving a problem by using systematic steps.

To solve the problem of mathematics required a method or steps that system so that the process of completion becomes easy and directed. One way to solve mathematical problems such as using a way of Polya. There are Understand the problem, Make a plan, Carry out our plan, and Look back at the completed solution [11].

The Understand the problem stage refers to an understanding of what is known, what is asked, or whether sufficient, insufficient, exaggerated or contradictory terms to seek out the question [20]. To believe or understand a problem can be done by questioning yourself about what is known or what is asked?. What data is given?, What is the condition of the problem?, Is it possible that the condition is expressed in the form of an equation or other relationship?, What is the condition given Enough to find the question?, Is the condition not enough or the condition is excessive or the condition is contradictory?, And whether it can be drawn and writing the appropriate notation to facilitate solving the problem? [17].
At the stage of understanding the problem of providing a foundation for learners to be able to step on the next stage [21], this is because students are not possible to solve problems correctly without any understanding of the problems faced [22].

The learner is said to have understood the problem if the learner expresses the question along with answers such as (1) what data or information is known of the problem, (2) what is the essence of the problem that requires solving, (3) is there any question about the formula, tables, or special signs, and (4) there are important conditions to note in the question [23], students can identify known, questioned elements and the adequacy of the necessary elements [24, 25, 18]. So the aspects that students should include at the stage of understanding the problem include what is known and what is asked [20].

In the make, a planning phase, referring to how the associated settlement strategy [20], making plans to solve problems is a mental activity that links between existing knowledge and problem-solving results [26]. A problem cannot be solved properly without good planning [27]. Planning for problem-solving depends largely on the creative experience of students in putting together a problem solving [22], the more varied their experiences are, the more creative the students tend to be in preparing a problem-solving plan [24].

At the stage of making plans, students can formulate mathematical problems or develop mathematical models, implement strategies to solve problems [25, 18, 24], looking for links between concepts or theories that are mutually Support and look for the formulas needed to solve the problem [23], besides that students need to know first some math problem solving strategies so that problem solving can be done more effectively [28].

Errors such as procedural errors can cause the student's plan to become unfavorable, so students are expected to make procedures to resolve the problem appropriately. Searching for links between known and unknown information, or performing calculations on unknown variables may prevent the student from error in the procedure for solving the problem. So students get the question of how the information that has been known will be interconnected to obtain the things that are not known or students do self-question like never had this problem before? Or has there ever been the same or similar problem in another form?, Did you know something similar to this? Which theory can be used in this problem?, Pay attention to the question! Think about a question once familiar with one or similar question!, If there is a similar problem to the problem that was ever solved, can the experience be used in the present problem? Can the results and methods used here?, Whether looking for other elements in order to take advantage of the original problem?, Can repeat the problem earlier?, Can declare in another form? Return to the definition!, If the new problem cannot be resolved, think about a similar problem and finish it! [17].

If a plan for solving a problem has been made (whether written or not), and has determined which strategy the student will use to continue the next stage [28,24]. The third stage is the implementation of the plan, which is the stage of implementation of the plan is the student has been prepared to perform calculations with all kinds of necessary data including the concepts and formulas or equations as appropriate [22].

At the stage of implementing the plan, the student must be able to form a more standard problematic system, in the sense that the formulas to be used are formulas that are ready to be used in accordance with what is used in the problem, then students begin to enter the data that have been obtained from the previous step, After which the students carry out the plan steps that have been made, so that the problems faced can be proved or resolved [22, 23]. In addition, students can question themselves about how to implement the settlement plan and check each step, check that each step is correct ?, and how to prove that the selected step is correct? [17]. Using that method, calculation errors or algorithm errors and procedural errors that can cause the process of solving the problem to be not maximally can be avoided.

At the last stage or look back at the completed solution stage the student will look back at the answer to make sure that the answer to the problem is correct, re-checking in problem-solving is a mental activity that links the existing knowledge to the problem-solving steps [26]. This step is important to check whether the results obtained are in accordance with the provisions and there is no contradiction with the question [23, 27].
Steps that can be used by the student to conduct a re-examination stage include matching the results obtained with the item in question, interpreting the answers obtained, identifying whether there is any other way to get the problem solved, and identifying whether there are answers or other results that meet [28]. Besides, it can also ask how to check the results of truth obtained?, Can be checked the rebuttal? Can you search for that result in another way?: Can you see it at a glance? Can the result or the way it is used for other questions? [17].

Although the back-end of the answer (check back at the completed solution) has the least weight among the other stages of Polya, but if this step is not done, the student cannot make corrections or correct mistakes such as conceptual errors, procedural errors and miscalculations has been done in the previous stages [23]. Students can minimize errors that may arise in the previous stage by doing this last step [24]. Students can check the systematics and stages of completion whether it is good and right or not, students can re-examine every step of the solution that does

3.2 The Use of Visual Media in Mathematics Problem Solving

Ability to solve problems is a prayer one ability that must be possessed by each learner in addition to the ability to think critically, logically, systematically. Even the problem-solving ability became the standard of mathematics learning process [26] and one of the objectives of mathematics learning in Indonesia [27]. Because of the importance of problem-solving skills, learners are expected not to avoid any mathematical problems encountered. However learners need to be given the motivation to solve math problems so that learners realize that math is an important lesson because it is implicitly in daily life.

For example, everyday events related to mathematics Among others are a student went to the grocery store to buy 5 kg of rice type A and 3 kg of rice type B. The price of each kg of type B rice more expensive Rp. 500, - of type A, if both the price of the rice is added to Rp. 6000, -. To find out what the price of rice A and the price of rice B do not pounds, the student can use the linear equations obtained when studying mathematics.

The success of learners in learning depends on the way of presentation of learning materials, instructional media and teaching methods used by teachers in teaching and learning process [29]. Learning media is a component that is interconnected with other components, so the learning media is expected to concretely abstract the material, increase student interest to learn, and reduce student misconception [30, 31, 32]. Unfortunately, the current learning of the students tends to be just the recipient of the message so that the communication that occurs in the learning is not going both ways, but one way. In fact, learning requires students not only act as the recipient of the message, but also acts as a communicator or messenger so that there are two-way communication and even a lot of direct communication [30].

In learning communication, learning media is needed to improve the effectiveness of learning achievement goals. That is, the learning process will occur if there is communication between the recipient of the message with the source/channel message through the media. In addition to good learning planning, the success of teaching and learning process is also influenced by the suitability between the subject matter and the level of students' thinking ability [30].

Planning a good learning, learning strategies that have been prepared very well, as well as learning materials that have been adapted to the level of students' cognitive understanding to be in vain in learning if the media used, is not appropriate. Because the success of learning is determined by two main components of teaching methods and learning media [32]. These two components are interrelated and inseparable, the use and selection of any particular teaching method have consequences on the appropriate use of the type of instructional media.

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and Cannot be separated, use and choice of one particular teaching method have consequences on the use of appropriate types of learning media.

Visual-shaped media can be used as an alternative to mathematics learning in junior high, considering that junior high school students are in a transition phase from concrete to abstract. The results of the study show that visual media are used in learning [34, 35, 36] especially in mathematics learning [37, 38, 39].

Visual media is a media that only relies on the senses of vision and plays a very important role in teaching and learning process, can facilitate understanding and strengthen memories, foster student interest and can provide support for the content of subject matter to the real world [40]. Visual media are divided into two, namely silent visual media and visual media motion. Still visual media such as photographs, books, encyclopedias, magazines, newspapers, reference books, and other printed products, drawings, illustrations, clippings, film frames, coupling films, transparencies, microphones, projector overheads, graphs, charts, diagrams and sketches, Posters, cartoon images, maps and globes, while the motion visual media is like a soundless movie [41]. Sometimes to attract users, visual media combined with audio becomes an audio-visual media like movies.

In order for effective visual learning media to be used, it should be placed in a meaningful context and students must interact with the visual (image) itself to ensure the process of information. This is because the effectiveness of learning through learning media one of them can be seen from the level of student enjoyment when learning to use pictorial text [10].

Based on that, for effective instructional media used to improve students' ability in solving problems, it is necessary to develop instructional media that reflect problem-solving steps, as done by creating an algebra equation by applying Polya problem-solving steps in solving the problem [19]. So that students indirectly feel guided in solving problems encountered. With guided problem solving is expected students can reveal or write every step that is on Polya, in other words, students can solve math problems with a structured and systematic.

4. Conclusion
The ability to solve mathematical problems is the ability of students to overcome the problems that were not clear the answer. Problems that arise in solving problems are ways that students use in solving mathematical problems has not been systematic or sequential, so the ability of students in solving math problems has not been maximized. In addition, the media used in mathematics learning in junior high school has not accommodated the cognitive development of children in the transition phase. One alternative to improve the ability to solve math problems for junior high school students is to use visual learning media that reflect the troubleshooting steps. Based on these conclusions it is necessary to develop a visual media to increase the ability to solve problems.

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