

MATHEMATICS LEARNING STRATEGIES TO IMPROVE CRITICAL THINKING AND PROBLEM-SOLVING SKILLS FOR MADRASAH IBTIDAIYAH STUDENTS

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Abstract

Critical thinking and problem-solving skills are very important for students to have both in the short and long term. However, in reality, students in madrasah ibtidaiyah have the low-level category of critical thinking and problem-solving skills. For this reason, it is necessary to have the right strategy to be able to improve these two abilities. This scientific article will answer the question of how mathematics learning strategies can improve critical thinking and problem-solving skills in madrasah ibtidaiyah students. By using descriptive qualitative methods and using library research in collecting data and information. Problem Based Learning can be the right strategy or model to achieve these goals. In addition, by integrating Problem Based Learning and IDEAL (identify, define, enumerate, analyze, list, and self-correct). This is because the strategy emphasizes the involvement of students in the process of solving a problem. Thus, students no longer depend only on the teacher but can also independently find solutions to the problems they are facing.

Keywords: mathematics learning, critical thinking, problem-solving, problem-based learning.

1. Introduction

The development of the world gradually occurs in all aspects of human life. This happens very quickly and dynamically and is supported by advances in information and communication technology. Various opinions were conveyed by experts to the general public, that human resources can one day be replaced by the latest technology. In addition, during the current disruption period, human resources are required to be dynamic so that they can continue to survive and face all the challenges that exist. There needs to be careful preparation to create quality and competitive human resources. Education has a very important role in efforts to make this happen. Therefore, optimizing education for all levels is important and must be done.

Problems in the world of education, especially in Indonesia, are things that must be addressed immediately. Efforts that can be made include many things, such as changes to the curriculum, changes in learning paradigms, improvements to facilities and infrastructure, and other steps that lead to improvements. The education sector must be optimized as a long-term investment in human resources. Education needs to be handled systematically and adhere to a paradigm that is relevant to current conditions. This is certainly a cycle that is interrelated and affects people's lives in the future. Mathematics education is one of the areas of concern because it is a basic knowledge that must be possessed by the community, especially students.

Mathematics is one of the sciences that has an important role in everyday life, the development of information and communication technology, and even contributes to the development of other sciences. This is also related to mathematical abilities that can be developed by a student at the learning stage. Mathematical ability includes several things, namely the ability to think logically, think critically, and the ability to solve problems. This shows that mathematical ability is not only related to the ability to count and work on math problems but is at a broader level. Therefore, mathematics needs to be taught starting from the most basic level, namely starting at Elementary School or Madrasah Ibtidaiyah.

Mathematics education is important to be given to students because through these students can be equipped with the ability to think logically, analytically, systematically, critically, and creatively. This is also following the objectives of learning mathematics, namely to create students who have critical thinking and problem-solving. The development of the world that exists today also requires students to have these two abilities. Thus, learning mathematics needs to be given appropriately also with a mature strategy (Arifuddin, 2019). Although in practice there will certainly be various kinds of challenges that must be faced by the government as well as by teachers, students, and parents.

Critical thinking is the ability to make decisions based on logical reasons and scientifically measurable facts (Arifuddin, 2019). Cahyana, Kadir, and Gherardini (Cahyana, Kadir, & Gherardini, 2017) also explain that critical thinking includes cognitive processes that are directed and clear to solve problems, make decisions, argue, and analyze assumptions. Someone who can think critically has the characteristics as conveyed by Setyawati (Setyawati, 2013), namely the ability to solve focused problems; the ability to analyze, generalize, and organize ideas; and decision-making abilities to solve existing problems.

Problem-solving is a very important activity in learning mathematics. As stated by Davis and McKillip (Haryani, 2011) problem solving is one of the most important objectives in learning mathematics. Through learning mathematics, the ability to solve a problem can be learned and absorbed and then applied in various fields of life such as science or everyday life. The ability to solve problems has a very high relationship with the ability to think critically. Both are interconnected and influence each other. With the problem-solving ability, students can further develop their thinking skills, develop alternative solutions to problems, and choose the best alternative that can be used to solve existing problems, up to the level of evaluation of what the students themselves have done.

Critical thinking and problem-solving skills are very important to be instilled in students through learning mathematics. This can be started from the most basic level, namely Elementary School or madrasah ibtidaiyah. These two abilities need to be taught to students with the aim that students can become more qualified and competitive human resources. In addition, students can solve problems at a light level such as solving math problems, or at a more complex level. Learning mathematics to optimize these two abilities can of course be adjusted to the level of a student's abilities so that it can be easier to understand and practice.

Efforts to realize students who can think critically and problems solving do not run smoothly. This is supported by the existence of several data showing that the achievement of these two capabilities is still low. As explained in the results of the Trends in International Mathematics and Science Study (TIMSS) analysis that 80% of students in Indonesia belong to a low level of critical thinking skills. In addition, the research of Widianari, Suarjana, and Kusmaryatni (2016) shows that the thinking ability of students, especially fourth-grade students is still low at 70% (Arifuddin, 2019). Other data that was also presented by TIMSS in 2015 related to the achievement results of Indonesian students showed that Indonesia was in the 44th position out of 49 countries (Kholid, 2018). This shows that the mathematical ability of students in Indonesia is low.

The low mathematical ability of students in Indonesia is caused by various things. One of them is learning that focuses too much on practice questions rather than a deep understanding of the concepts of the material being taught. Not infrequently the learning process is carried out in one direction from teacher to student without providing opportunities for students to compile and connect their knowledge. The lecture and memorization methods are considered to be one of the causes of the low critical thinking and problem-solving abilities of students. This is because students are too fixated on what is conveyed by the teacher and that becomes a determination in their memorization without any other effort to understand it further. This then ignores the process of deductive and inductive reasoning as nature in mathematics (Kholid, 2018).

This article tries to answer the question of how mathematics learning strategies improve critical thinking and problem-solving skills in madrasah ibtidaiyah students? This is based on the problems described above, which are related to students' mastery of mathematics in Indonesia, especially those related to critical thinking and problem-solving skills which are still relatively low. This article is expected to be able to answer the questions above and provide an overview of the right strategies to improve students' critical thinking and problem-solving skills.

2. Method

The method used in writing this article is descriptive qualitative. The author uses a descriptive qualitative method that aims to describe the problem in detail. To be able to describe the problem in detail, an in-depth understanding is carried out so that the information conveyed becomes more accurate (Neuman, 2014). The data collection technique used is observation, interview, and documentation. The data collection technique in this research uses the interview technique by asking and answering questions that have been prepared before to the informants. Another data collection technique is documentation to get more data, documents or other things related to the research. The data analysis technique used in this research is qualitative technique, namely interactive analysis techniques such as data reduction, data display, and conclusions.

3. Results and Discussion

Critical thinking is a cognitive process that has clear directions and goals to solve problems, make decisions, analyze, and conduct scientific research (Cahyana et al., 2017). Critical thinking can also be interpreted as an ability to convey personal opinions in an organized manner and the ability to evaluate the phenomena around it. When a student can think critically, then basically the student can answer the how and why questions based on the conceptual knowledge that has been obtained in the learning process. The ability to think critically has a basis in analyzing an argument and then generating new thoughts on a fact of the problem. This then makes critical thinking skills are also said to be higher-order thinking skills that can be learned and trained (Kholid, 2018). Another definition of critical thinking is an intellectual process of conceptualizing, applying, analyzing, synthesizing, and evaluating existing information from observations, deepening reflection, and reasoning (Peter, 2012).

Critical thinking skills will lead students to be able to think rationally. When there is information obtained, students will try to explore the information through a set of questions or other instruments that can reveal the truth of the information conveyed. In addition, students will also become more open-minded. Students will find it easier to accept opinions or perspectives submitted by others which can then be used as information in finding the truth and solving problems. As stated by Kamarulzaman that critical thinking aims to solve a problem that is being faced through a series of processes such as evaluation and selection of the best alternative that has been determined (Kamarulzaman, 2015). One madrasah ibtidaiyah teachers also explained that in critical thinking, students are trained to have the ability to solve problems and to identify problems. By thinking critically, students are more confident in the process of learning.

As explained in the introduction, the critical thinking ability of students in Indonesia is low. This is in line with the results of Ahmad Arifuddin's research on students' critical and creative thinking skills in mathematics learning at madrasah ibtidaiyah which shows that the average critical thinking ability of students is in a low category. This is because the learning method still uses the old paradigm where students are not actively involved in learning activities (teacher-oriented). Other causes that also become an obstacle are student interest in mathematics which tends to be low, understanding of basic concepts is not maximized, and minimal encouragement from parents (Arifuddin, 2019).

Some characteristics of madrasah ibtidaiyah students who have critical thinking skills include asking important questions and problems, collecting and assessing relevant information, drawing conclusions based on clear reasons, and being able to overcome confusion. From these characteristics, it can be seen that the problem identification process until its completion is carried out in stages to self-control. Heri Purwanto (teacher) also explained that the ability of students to think critically can make students to be more active in learning and analyzing solutions while trying to learn and identify problems. This will have a good impact on student learning outcomes. In addition, the critical thinking process can be shown at least in several stages. Namely the stages of clarification, basic support, interpretation, analysis, inference, and explanation (Kholid, 2018). Some of these stages are carried out carefully in practice, especially if you look at the research conducted by Idham Kholid.

Ahmad Arifuddin also explained that the process of improving students' critical thinking skills did not run smoothly. This then causes learning outcomes to be still below the desired standard. Barriers to student concentration in the learning process are also one of the problems, both due to internal factors (from within the

students themselves) and external factors (environment). This is also in line with the results of research conducted by Kurniati and Astuti which showed that students' critical thinking skills tend to be classified into medium and low categories. This can be seen when the experiment uses the form of a one-group pre-test post-test design (Kurniati & Astuti, 2016). The conventional method used by the teacher in the learning process is less effective to realize students who have critical thinking and problem-solving skills. For that, we need a strategy to make this happen.

Problem-solving is one of the most important skills that everyone needs to have to be used in everyday life. Most of the existing problems require a solution as a form of solving the problem. Likewise with problems in learning mathematics. Problem-solving skills are needed by students operationally to solve math problems in various forms. Fundamentally, this is closely related to critical thinking skills. The ability to think rationally is needed. So that when students are faced with a certain problem they can solve it correctly (Rachmantika & Wardono, 2019).

The problem in learning mathematics is a condition where students cannot solve the problem. Mathematical problems can become a problem if the right and relevant way to solve them has not been found. Students who can think critically will certainly be increasingly challenged to be able to solve these problems - math problems that are considered complicated. This is what makes the two abilities interrelated with each other. There are several characteristics of a problem such as requiring more than one step to a solution; there are elements that are interesting and relevant to students' lives and contain realistic mathematical values (Kholid, 2018). Anisatul Hikmah (teacher) explained that learning mathematics is a learning that trains thinking and reasoning patterns in drawing conclusions, developing abilities in solving problems and developing abilities.

Problem-solving is also one of the goals of the mathematics learning process. Where mathematics learning is intended so that students can solve existing problems through a series of processes such as understanding the problem, to interpreting the results obtained for the problem. Problem-solving is not only related to the application of a set of rules that have been taught and mastered but more than that. The rules (e.g. formulas in mathematics) are only used as guidelines in the context of solving the problems at hand (Hardini & Puspitasari, 2012). This is certainly very important for students both for present and future life.

There are at least five problem-solving indicators. First, identify what is already known, asked, and what is needed. This is in Idham Kholid's research conducted by students who are classified as having critical thinking abilities. Second, compiling a mathematical model to solve the existing problems. Third, apply a strategy or mathematical model to solve problems both in the context of mathematics or outside the context. Fourth, interpret the results based on the existing problems. Fifth, there is a meaning to mathematics so there are benefits that can be taken from these activities (Ulvah & Afriansyah, 2016).

Problem-solving ability is very important for students of various levels of education. This ability will have an impact not only in learning mathematics but also in other learning. However, in reality, students still have difficulty solving problems, especially in the mathematics learning process. Students belonging to the category of having problem-solving abilities tend to decrease. Many students know and memorize mathematical formulas but do not understand how to apply them when faced with non-routine/unusual or certain problems. It is often also found that students are confused when faced with questions that are different from what has been explained by the teacher (Nurwahid & Shodikin, 2021). Yudi Santoso (teacher) explained that many students are always constrained in memorizing mathematical patterns and always forget them in math problems.

Based on the various problems that have been described in the previous section, namely the ability to think critically and problem-solving in madrasah ibtidaiyah students tend to be decrease. Therefore, it is necessary to have the right strategy to be used in the mathematics learning process so that the critical thinking and problem-solving abilities of madrasah ibtidaiyah students can be improved. One strategy that can be used is Problem Based Learning.

Problem Based Learning or PBL is a learning model that emphasizes student involvement in the process of solving a problem. By using the PBL model, students will be more motivated and have a high curiosity when the mathematics learning process takes place. This is because the PBL model provides opportunities and space for

students to be able to think more actively, communicate, explore and process data, and conclude. In the learning process, students not only listen to what is conveyed by the teacher but become more active with efforts to find solutions to the problems they face. The problems faced by students become things that can trigger students' curiosity in finding solutions through a series of systematic steps. This PBL model is considered to be one of the right strategies to improve critical thinking and problem-solving skills in madrasah ibtidaiyah students (Nurwahid & Shodikin, 2021).

Problem Based Learning (PBL) is a learning model that emphasizes critical study, analysis, and argumentative centered on students as those who seek solutions to problems so that students can build their knowledge and skills (Zainal, 2022). In Problem Based Learning, there are several characteristics of the problem that need to be considered, as stated by Sockalangan & Schmidt. First, there is conformity with the learning objectives. Second, there is an opportunity for students to learn independently. This shows that students are not only dependent on their teachers, but also have the opportunity to develop their knowledge and skills independently. Third, encourage critical thinking. The problems that arise are not something that can be easily solved, so students will be encouraged to be more critical in responding to them. Fourth, create teamwork. Fifth, develop students' interests and talents. Sixth, by the existing format and provisions. Seventh, the problems raised are clear so as not to confuse students in the learning process. Eighth, encourage students to be able to work carefully and diligently. Ninth, the problems are relevant to mathematical concepts and the real world. Finally, the issues raised are related to the concepts that have been conveyed or taught previously (Zainal, 2022).

The steps that can be taken in the learning process using the Problem Based Learning are at least five stages (Zainal, 2022), namely as follows. First, orienting students to the problem. In this stage, the teacher can explain the problem that will be a topic to be solved by students in groups. The problems defined should be guided by the characteristics of the problems described in the previous paragraph. Then students can observe and understand the problems that have been given. Second, organize students to explore knowledge and skills. This relates to the task of each student in the group. The teacher can provide direction so that each student understands what is his or her task, both individually and in groups. In this stage, students conduct discussions on initial observations of the problem. Then start dividing tasks to find the right solution to the problem.

Third, guide the process of tracking individuals and groups. The involvement of each student in the process of discussion and finding solutions is something that needs to be emphasized in Problem Based Learning. For this reason, the teacher must monitor the discussion process and student tracking so that their involvement in the group can be ensured. In this stage, students look for relevant sources to be material in group discussions. Fourth, develop and present the results of discussions and searches. In this stage, the discussion takes place and can provide results in the form of solutions to the problems given. The teacher can direct students to start making reports on the results of the discussions that have been carried out. The report can then be used as material for the group to present and discuss further. Each group member has a role in the presentation process. Finally, analyze and evaluate the problem-solving process that has been carried out. In this stage, feedback from one party to another can be conveyed. Therefore, the teacher has an important role so that the process can run smoothly and be conducive so that the important points in the feedback conveyed can be absorbed properly. Based on the feedback that has been given, then each group can conclude the discussions and inputs that have been given.

In addition, several steps can also help students in developing critical thinking and problem-solving skills. In addition, this instrument can also be applied to the steps above as a tool so that the learning process can run better and achieve the desired goals. These steps are known as IDEAL. Namely Identify, Define, Enumerate, Analyze, List, and Self-correct. Identifying relates to the identification of the problem at hand. This can be helped by asking the question "what are the problems we are facing?" Define, relates to steps in determining the context of the existing problem. This relates to the question of what facts frame the problem. Enumerate, relates to calculating and considering several alternative solution options available. Whether each of these alternatives is a reasonable thing and can be used. Analyze, in this stage, the available options are analyzed to find out what is the best course of action that can be taken. List, at this stage it is necessary to convey why the selected action is the best thing to do. Need to convey the right reasons for the choices. Self-correct, is this stage students can re-evaluate the things that have been done and correct whether there are things that have been missed (Peter, 2012).

Combining Problem Based Learning with IDEAL can be one of the right strategies to improve students' critical thinking and problem-solving skills. Between the two learning models, there is a continuity that is relevant to each other so that the learning process can be carried out with a more focused focus on achieving goals. Thus, efforts to improve the critical thinking and solving skills of MI students can be carried out more optimally.

4. Conclusion

Based on the explanation above, it can be concluded that critical thinking is a cognitive process that has clear directions and goals to solve problems, make decisions, analyze, and conduct scientific research. Critical thinking and problem-solving skills are very important to be instilled in students through learning mathematics. However, in reality, the critical thinking and problem-solving skills of madrasah ibtidaiyah students are in a low category. For this reason, it is necessary to have a strategy that can improve the critical thinking skills and problem-solving of madrasah ibtidaiyah students. Problem Based Learning can be the right strategy or model to achieve these goals. In addition, by integrating Problem Based Learning and IDEAL (identify, define, enumerate, analyze, list, and self-correct). This is because the strategy emphasizes the involvement of students in the process of solving a problem. Thus, students no longer depend only on the teacher but can also independently find solutions to the problems they are facing.

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