Analysis of Problem Solving Skills of Class VII Students on Earthquake Material and Mitigation

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Abstract: The variety of levels of student learning motivation causes learning in class not to be implemented optimally even to affect the problem solving process. One of the lessons that emphasize the skills in the form of the ability to solve problems is Natural Sciences (Natural Sciences). Therefore, this research is a tukuk tukuk analyzing the ability to solve the problem of junior high school students in grade VII in Gempta and Mitigation material. This research uses a scientific approach to cooperative learning models. The research design uses pretest and posttest. The pretest results are 54.74% and the posttest average value is 75.73%. Based on the results of the discussion test it can be interpreted that there are significant differences or improvements to the results of the pretest and posttest in both classes of class VII C and VII D. The results of the pretest include the Dalas of the Poor Category. Medium category, while posttest results show good results.

Keywords: Problem Solving Skills; Science Learning; Middle School Students

Introduction

Education is one indicator of a country that is considered developed or developing Artinta,(2021). Science learning according to the 2013 curriculum aims one of them to form the ability of students to solve a problem. States that in the 21st century, one of the abilities th at students must possess is problem solving ability. The rapid development of information and communication technology is currently having a strong influence on various areas of life, including education. Education is always changing so that it demands continuous improvement. However, it also requires humans to have sufficient skills to be able to keep up with the very rapid development of science and technology (Siahaan et al. 2017)

The world of education in Indonesia is currently still faced with complex problems. Education quality standards in Indonesia must be improved. This requires serious attention from both the government, the community, parents and teachers so that the

implementation of education can take place as expected. The purpose of implementing a learning model or strategy is to create a learning climate with certain conditions to assist the learning process in order to create effective, efficient and attractive learning conditions (Yerizon et al., 2021). This problem-solving ability is needed so that students are able to compete globally in this century (Dewi et al., 2017). Given the nation's challenges in the future which are increasingly competitive, problem solving skills are very important for students (Cahyani & Setyawati, 2016).

Problem solving is a process of achieving goals which consists of the process of organizing concepts and skills into a new pattern (Riffyanti & Setiawan, 2017). Problem solving skills can assist students in designing appropriate, careful, systematic logistics decisions and paying attention to various points of view (Paidi, 2011). Problem solving skills also need to be measured in order to find out how students are prepared to face the challenges of the 21st century (Hidayat et al., 2017).

There are several factors that affect students' problem solving abilities, especially internal factors such as prior knowledge, appreciation, and logical intelligence Putu (2016) interests, intelligence and cognitive abilities of students. Meanwhile, from external factors, including the learning model/method used, the learning environment created and the provision of motivation from the teacher (Hanifa et al., 2018).

Polya stated that problem solving is an attempt to find a way out of a difficulty and achieve something that cannot be achieved immediately. The steps for solving the problem include 4 stages including; (1) Understanding the Problem (Understanding the problem), (2) Plan (Developing a problem-solving plan), (3) Implementing the Plan (Implementing the problem-solving plan) (4) Reviewing (Re-examining the results obtained). Problem solving is an element that must be owned by students, students who have motivation to learn will be diligent in doing assignments, tenacious and never give up in solving various problems and obstacles, interest in the learning process, problem solving especially those related to problems (Sukmasari & Rosana, 2017). This is as explained by Gomulya (2012) that in analyzing a problem, the better students analyze, the better students will be in providing solutions, both action plans and decisions.

The National Council of Mathematics Teachers (NCTM, 2000) explains that the process of solving problems in learning is very important. One of the lessons that master this skill is Natural Sciences (IPA). Science is the vast human knowledge acquired by systematic experimentation and experimentation and explained by rules, laws, principles, theories and hypotheses (Iskandar, 1997). Another opinion explains that science is the science of the universe and its contents and the events that occur in it which are developed by experts based on scientific processes (Sudjana, 2013).

One part of the problem solving process is making a decision which is defined as the best solution from a number of available alternatives. Inaccurate decision making will affect the quality of the results of the problem solving carried out. However, the ability to solve scientific problems in students is still low, this can be seen from the ability of students who experience difficulties when studying environmental material. As revealed by the results of the study Mustofa & Rusdiana (2016), revealed that students' problem solving skills were still in the low or lacking category. This is because teachers still use conventional learning methods, and students are less exposed to concrete problems, because the problems given by students are not complex, monotonous, and less varied. In addition, one of the factors that influence the low results of solving science problems in students also comes from within the students themselves.

Teacher motivation is very influential because teacher motivation will encourage students to be more enthusiastic about participating in learning. If there is motivation from the teacher, then the desire of students will appear so that learning can run well (Olpado & Heryani, 2017). As stated Posamentier (2015), revealed that teacher giving motivates students are needed to increase student interest in developing problem-solving skills.

The problem-solving process is suitable for application in science learning because it can improve students' thinking skills logically, critically, creatively and innovatively. In addition, problem-solving skills provide an opportunity for students to develop thinking skills in solving problems through constructing knowledge that students have independently by utilizing various learning sources so that understanding of the material becomes deeper and learning becomes more meaningful. (Tivani & Paidi, 2016). Teaching students to solve problems allows students to be more critical and creative in making decisions in their lives (Hadi, 2014). This is in line with the opinion (Ulya 2016 in Nurhayati 2020) which explains that problem solving is a life problem that contains ways of analyzing, thinking, predicting, and estimating. Therefore, Indonesian students in particular are expected to be able to master this skill well.

The description above explains how important students' problem-solving abilities are, especially in learning science. Based on the search above, we will try to see how far the science problem solving abilities of class VII students of SMP Negeri 1 Depok. If the ability to solve problems is known, then training and development of this ability can be carried out. Selection of junior high school students as research subjects is a process of research and development of critical thinking that is more efficiently implemented at the junior high school level. The characteristics of junior high school students who have started to be able to think critically independently can be observed and their abilities developed.

Method

The research was carried out in April 2022. First, the research began with preliminary activities including the planning stages and determining research subjects. The second stage is the pretest and posttest problem solving skills preparation stage. The third is the process of collecting data obtained from student activities working on test questions. The fourth is the data analysis stage, which is a data processing activity carried out by the researcher. The fifth draws conclusions which is the last

stage, from this stage answers are obtained from this research.

This study uses a scientific approach with a cooperative learning model. The method used in this research is a quantitative descriptive method. The research design uses Pretest and Posttest. The research subjects were students of SMP Negeri 1 Depok grades VII C and VII D in the subject of Natural Sciences (IPA) with seismicity and mitigation materials. The research instrument used was a student problem-solving ability test consisting of 10 multiple-choice items and 5 description questions adapted to 5 indicators of problem-solving ability, including: 1) problem identification, 2) data collection, 3) hypothesis determination, 4) test the hypothesis, and 5) draw conclusions. Each indicator is represented by 3-4 items which aim to obtain more valid and relevant data.

Research data analysis was carried out by calculating the average achievement score of students' problem solving ability indicators in the form of a percentage. The average score achieved is then categorized based on the problem solving assessment criteria in Table 1. How to calculate the average percentage score of students' problem solving ability scores is to use the following formula.

$$\text{percentage value} = \frac{(gain\ score)}{(maximum\ score)} \times 100\% \qquad (1)$$

Table 1. Student Problem Solving Assessment Criteria

Percentage %	Rating Category
$x > 81.25$	Very good
$81.25 > x \geq 62.5$	Good
$62.5 \geq 43.7$	Less
$x \leq 43.7$	Very less

Results and Discussion

Problem solving skills are one of the important competencies that students must have (Greiff et al., 2013). This is because through problem solving skills, new experiences can be grown in students by finding solutions and problem solving processes (Lismayani et al., 2017). In addition, the development of problem solving skills in students can have a positive impact on other skills such as science process skills. Problem solving skills can also be defined as the skills of identifying problems using non-automated strategies so that students will be able to solve their own problems and work more effectively (Nugroho & Widodo, 2018).

This study used various instruments, namely documents (test results of students' science problem solving abilities), observation sheets, and researchers. The problem-solving ability test used in this study has been validated so that it is ready for use in research. The selected research subjects were then asked to take a

written test to determine students' natural science problem-solving abilities. The data is then described according to the Polya problem solving steps which include understanding the problem, planning a strategy, implementing the strategy, and re-checking the correctness of the solution. Problem solving ability is done based on problem solving steps. Furthermore, the data were analyzed based on the average value of problem solving indicators.

The results of this study were obtained from the problem-solving ability test questions of 63 students in class VII C and VII D of SMP Negeri 1 Depok in the form of the average percentage of student achievement. The research instrument used was the pretest and posttest of students' problem solving abilities which consisted of 10 multiple choice questions and 5 descriptive questions adapted to 4 indicators of problem solving ability, including: 1) understanding the problem, 2) planning a solution, 3) troubleshooting, 4) check again. Each indicator is represented by 3-4 items which aim to obtain more valid and relevant data.

Based on the measurement results in Table 2, the problem solving ability of class VII students of SMP Negeri 1 Depok with an average score of the percentage of problem solving ability with the pretest results obtained was 54.74%. Detailed indicator data understanding the problem 57.96%, planning a solution 55.21%, solving the problem 52.92%, checking again 52.88%. Based on these results, the average posttest score was 75.73%. The details of the data are understanding the problem 81.73%, planning a solution 72.53%, solving the problem 72.50%, re-checking 76.17%

Based on the test results there was a significant difference, for the pretest results in both classes, namely class VII C and VII D, were included in the less good category, while the posttest results showed good results. The cause of the difference or increase in pretest and posttest scores is due to the innovative use of new teaching materials (e-modules) and new learning models for students, with more emphasis on cooperative learning models.

Table 2. Results of Problem Solving Ability Indicators

Problem solving Indicator	Performance		Category	
	Pre test	Post test	Pre test	Post test
Understanding the problem	57.96	81.73	Less	Good
Planning solutions	55.21	72.53	Less	Good
Problem solving	52.92	72.50	Less	Good
Check again	52.88	76.17	Less	Good
Average	54.74	75.73	Less	Good

Cooperative learning is a learning method that has positive benefits when applied in the classroom. Some of

its strengths include: teaching students to improve thinking skills, seeking information from other sources and learning from other students; encourage students to express their ideas verbally and compare them with the ideas of their friends; and help students learn to value students who are good and students who are weak, also accept these differences. The involvement of all students can provide an active atmosphere and make learning seem democratic. That is, each student has a role and provides learning experiences to other students.

Based on the results of data analysis it is known that the ability of students to solve science problems can be assessed from the average ability of students to answer questions on each indicator. Overall, the results of students' natural science problem-solving skills on the total percentage of indicators for checking the correctness of completion still look low compared to other indicators. The indicators of students' problem-solving abilities above ideally have been able to pass all the indicators even though there are stages they have not gone through, starting from understanding the problem, planning strategies, implementing strategies, and re-checking the correctness. solution. The lack of students' scientific problem-solving skills can be caused because students do not understand the problem well,

The low problem-solving ability of class VII students of SMP Negeri 1 Depok is caused by several factors, including the infrequency of students practicing problem-solving-oriented problem-solving skills, and the lack of accuracy of students in the process of working on problems. questions or with learning methods that have not been applied. all facilitate in training and teaching student problem solving skills. Then the learning that must be obtained by students cannot be separated from learning problem solving, because problem solving is the highest stage in learning theory so that it will continue to improve students' abilities in solving every given problem.

The results of this study are almost in line with the results of previous studies conducted to get results students' problem solving abilities are considered to be lacking, because when asked to solve problems students are still focused on books (textual) and have not been able to develop stages in solving problems. On the other hand, teachers are still looking for alternative learning models that are able to practice this problem solving ability. In line with research (Sam & Qohar, 2016) shows that problem-based learning based on Polya's problem-solving steps can improve solving skills.

Based on the research that has been done, the conclusions obtained are that problem-solving skills are needed to train students to be accustomed to dealing with various problems in life that are increasingly complex, not only in science itself but also problems in other fields of study and problems in everyday life.

Therefore, students' ability to solve problems needs to be continuously trained so that students are able to solve the various problems they face. This problem-solving ability can help students make the right decisions, be careful, systematic, logical, and consider various points of view. On the other hand, a lack of problem solving skills can result in students getting used to doing various activities without knowing the purpose and reasons for doing so.

Conclusion

Based on the results of the discussion test, it can be concluded that there is a significant difference or increase in the pretest and posttest results in both classes, namely class VII C and VII D. The pretest results are included in the unfavorable category. medium category, while the posttest results showed good results. Factors that influence students' problem-solving abilities are: lack of accuracy in students working on questions, students rarely work on questions that are oriented towards problem-solving skills and lack of mastery of concepts or learning methods that are applied have not fully facilitated training and teaching. students' problem solving abilities. The implications of this research can provide information about the level of students' problem-solving abilities against the displayed indicators.

Based on the conclusions that have been formulated, the researcher submits suggestions to future researchers who will analyze students' abilities, it is advisable to analyze other science abilities, and it is better to examine other variables that are considered to affect students' abilities. scientific problem-solving skills, so as to provide wider benefits for the field of education. Natural science.

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