Scientific Approach to Improve Mathematical Problem Solving Skills Students of Grade V

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Abstract. This study investigates the skills of elementary school students’ in problem solving through the Scientific Approach. The purpose of this study is to determine mathematical problem solving skills of students by using Scientific Approach is better than mathematical problem solving skills of students by using Direct Instruction. This study is using quasi-experimental method. Subject of this study is students in grade V in one of state elementary school in Cirebon Regency. Instrument that used in this study is mathematical problem solving skills. The result of this study showed that mathematical problem solving skills of students who learn by using Scientific Approach is more significant than using Direct Instruction. Base on result and analysis, the conclusion is that Scientific Approach can improve students’ mathematical problem solving skills.

1. Introduction
Mathematics is the foundation of science. Therefore, mathematics is one of the important lessons to be learned. This is affirmed [1] "Mathematics learned through formal education (school mathematics) has an important role for students as a provision of knowledge to shape attitude and mindset." Therefore, mathematics is studied in every level of education, from elementary school level to college.

Important problem solving skills are possessed by students to achieve optimal mathematical learning outcomes. From year to year, problem solving emerged as one of the concerns at all levels of school mathematics. The National Council of Supervisors of Mathematics (NCSM) states that "Learning to solve problems are the main reasons to learn mathematics" [13].

But in fact mathematical problem solving skills students in Indonesia is low. It can be seen from the results of The Third International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) also reflects the low ability students' mathematical problem solving. From the results of TIMSS 2011, Indonesia is in the 38th position of 42 countries with a score of 386 [9]. The score obtained by Indonesia is below the international average score of 500. Based on PISA 2012 results, Indonesia ranks 64th out of 65 participating countries [11].

Problem solving is one of the competencies that must be possessed by students in learning mathematics in elementary school. [17] The competence of problem solving, it is expected that students are able to build a new knowledge of mathematics, solve mathematical problems in other contexts, implement and adapt a variety of strategies to solve problems, and to monitor and reflect on the process of mathematical problem solving.

Based on the above explanation, it appears that the ability of solving mathematical problems in elementary school is very important. Therefore, there is an effort to encourage students to practice in improving their mathematical problem solving skills. Therefore, it is necessary for the teacher to actively study the students. [16] In order for learning to maximize the learning process and mathematics outcomes, teachers need to encourage students to be actively involved in discussions, ask questions and answer questions, think critically, explain each and every answer. Therefore, it is needed a learning that can encourage students to be actively involved in discussion, questioning, answering questions, and enjoyable learning activities, which in turn will have a positive impact on student
achievement and learning outcomes. The learning that is expected to develop the ability to solve mathematical problems is learning by the Scientific Approach.

Based on the above problems, the researcher is interested to conduct research by reviewing "Scientific Approach to Improve Mathematical Problem Solving Skills Students of Grade V".

The purpose of this study is to determine whether there are differences in the ability to solve the problem of mathematical problems of students who gain learning through the Scientific Approach with Direct Instruction.

A problem exists when a person reaches a goal but he does not know how to achieve it [8], a problem as a situation in which there are certain hurdles [5].

National Council of Teachers of Mathematics (NCTM) [10] to solve the problem is not only a goal to learn math, but it is also the main tool to learn. Therefore, problem solving skills become the focus of mathematics learning at all levels, from elementary school to college.

Four steps or steps that must be taken in solving the problem is, understanding problem, devising a plan, carrying out the plan, and looking back [12].

Scientific method or more commonly said the Scientific Approach is an approach in the 2013 curriculum. In the implementation, there are those who make scientific as an approach or method. But the characteristics of the Scientific Approach not unlike the scientific method. Scientific Approach In the intended learning includes observing, questioning, experimenting, and communication all subjects.

Five steps of the learning process using the Scientific Approach are: observing, questioning, associating, experimenting, and communication [7].

The 2013 curriculum uses the Scientific Approach because this approach is judged appropriate for developing students' attitudes, knowledge, and skills. Learning by the Scientific Approach is a learning process designed in such a way that students actively construct concepts, laws or principles through observing stages (to identify or find problems), formulate problems, propose or formulate hypotheses, collect data with various techniques, analyze data, draw conclusions and communicate concepts, laws or principles that are "discovered" [2].

2. Experimental Method
The method used in this research is quasi-experimental method. [14] studies with the quasi-experimental method of subjects were not randomly grouped, but the investigators accepted the make shift state of the subject. The study design will be used in this research is the nonequivalent control group design.

The research design used in this research is the pretest-posttest group design. Design (Pretest-Posttest Design) as follows:

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**Figure 1. Nonequivalent control group design**

Description:

\( X \) : The treatment of learning by using Scientific Approach

\( O \) : Pretest-postest the mathematical problem solving skills

---- Subject not grouped randomly

Subjects in this study are the students of class V in one of elementary school in Cirebon Regency. In this study a class is used as an experimental class that will be given learning by using the Scientific Approach, while one other class is made control class that will be given Direct Instruction.

The test instrument used in this research is a mathematical problem solving test. Mathematical problem solving test problems were given in the experimental class and control class at the beginning of treatment as pretest and at the end of treatment as postest. This test is given to students with the aim of knowing the ability to solve mathematical problems. It is therefore based on indicators of mathematical problem solving skills.
3. Result and Discussion

The research was conducted on the application of learning using the scientific approach in class V. The implementation of the research was conducted for eight meetings. Before doing the learning, the researcher first pretest the two classes. The result of the preliminary data analysis shows that the experiment class data is normally distributed, while the control class data is not normally distributed. Further test Mann-Whitney U to find out the average difference in mathematical problem solving skills and class control class experiment before action. The result shows Sig value (2-tailed) is 0.801 greater than the significance level α = 0.05 so that H₀ is rejected. This means that there is no difference in the mean mathematical problem solving skills between the experimental class and the control class before the action is taken or the two classes are from the same condition.

In this study the data analyzed include the pretest and posttest score of mathematical problem solving skills. Based on pretest and posttest score calculated the normalized gain (N-gain) ability of mathematical problem solving both in experiment class and control class. The following are descriptive statistics of the pretest, posttest, and N-gain scores in the experimental and control classes.

| Table 1. Descriptive Statistics of Mathematical Problem Solving Skills |
|---------------------------------------------------------------|
| **Total Students** | **Min. Score** | **Max. Score** | **Average** | **Total Students** | **Min. Score** | **Max. Score** | **Average** |
|-------------------|----------------|---------------|-------------|-------------------|----------------|---------------|-------------|
| **Pre Test**      | 30             | 6             | 87          | 39.37             | 30             | 16            | 78          | 39.17       |
| **Post Test**     | 30             | 53            | 100         | 73.17             | 30             | 46            | 85          | 59.07       |
| **N-gain**        | 30             | 0.18          | 1.00        | 0.54              | 30             | 0.17          | 0.68        | 0.32        |

After getting a different treatment, it appears that the data posttest second mathematical problem solving skills of different classes. This is also evidenced based on the statistical test with the result of posttest data analysis shows that the experiment class data is normally distributed, while the control class data is not normally distributed. Further test Mann-Whitney U to find out the average difference in mathematical problem solving skills and class control class experiment before action. The test results show the Sig value (2-tailed) which is 0.000 less than the significance level α = 0.05 so that H₀ is rejected. This means that there is a significant difference between the postures score average ability problem solving mathematical problem of control class and experiment class.

To determine the data improvement mathematical problem solving skills by learning analyzed using a score of N-gain mathematical problem solving skills in the experimental class and control class. Test the difference in the average N-gain mathematical problem solving skills was conducted to prove the hypothesis of the research is, there are differences in the increase in mathematical problem solving skills of students acquire learning Scientific Approach and improved mathematical problem solving skills are gained Direct Instruction. Based on statistical tests through t-test Independent test known value of Sig. (2-tailed) which is 0.000 less than the significance level α = 0.05 so that H₀ is rejected. This means that there are differences in the ability to solve mathematical problems of students who acquired learning with the Scientific Approach and improvement of problem solving ability of mathematics that obtained Direct Instruction.

Based on the results of processing and data analysis, found an increase in problem solving skills of mathematical students who follow the learning with Scientific Approach and students who follow Direct Instruction. Increased class mathematical problem solving experiment proved with N-gain is 0.54 are in the middle criteria. Meanwhile, in the class of N-gain control of her that 0.32 was the criterion of being. Although both classes having N-gain category being but when compared, the experimental class N-gain greater than N-gain control class. Thus improving the problem solving ability of the experimental class mathematics is better than improving the mathematical problem solving ability of the control class.

This is in line with the results of the study [18] that based on the results of the analysis of research data obtained that students' mathematical problem solving skills in general increased. Improved
mathematical problem solving skills of students who get learning with the Scientific Approach better than students getting conventional learning.

The increasing ability of mathematical problem solving of students who gain learning by using the scientific approach shows that by familiarizing the students learn according to the stages contained in the scientific approach, observing, questioning, experimenting, associating, and communicating can improve students' mathematical problem solving skills.

The Scientific Approach can provide great opportunities for students in developing students' reasoning and mathematical communication skills because this approach allows students to be more active. The ability of reasoning and communication in mathematics is an element of mathematical problem solving skills of students, because in solving the problem students need to associate the concept with the activities of reasoning and presenting ideas through communicating.

Based on the results of the analysis, it is known that learning by using the Scientific Approach can improve students' mathematical problem solving skills. Students try to find answers to solve problems through the indicators contained in the ability to solve mathematical problems.

4. Conclusion

Based on the research that has been conducted on the improvement of students' mathematical problem solving skills among the group of students who obtained the learning by using the Scientific Approach and the group of students who obtained the Direct Instruction, then obtained the conclusion from the research results that is, there is a difference in the ability to solve mathematical problems of students who obtained learning with using the Scientific Approach and improving the problem solving ability of students who get Direct Instruction.

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