

# The Implementation of Problem Based Learning Models to Improve Mathematical Problem Solving Ability of Students on Arithmetic Materials in Class VII Junior High School

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**Abstract-**This study aims to determine the improvement of problem solving ability of mathematics students through the model of Problem Based Learning on social arithmetic material in class VII Junior High School. This research is Classroom Action Research (PTK). Subjects in this study were 30 students of class VIII Junior High School. Instruments used to obtain data are tests and observation sheets. The result in cycle I shows the number of students who achieve mastery learning is 15 of 30 students or 50% with an average grade 68.25%. The result in cycle II obtained by many students who reach the completeness of learning that is 26 from 30 students or 86.67% with the grade average 84.75%. This means an increase in problem solving ability of students from cycle I to cycle II. Based on the classical learning completeness criteria then this learning has reached the target of learning mastery. Thus it can be concluded that through the model of learning problem learning, mathematic problem solving ability of student especially the subject matter of social arithmetic was increased in class VII Junior High School Medan.

**Keywords:** *problem based learning, mathematic problem solving ability*

## I. INTRODUCTION

Mathematics is a subject that is taught at every level of education in Indonesia ranging from elementary school (SD) to high school (SMA). Mathematics should be given to all students from primary schools to equip students to have the ability to cooperate. In addition it is also intended to develop

the ability to use mathematics in solving problems and communicating ideas or ideas.

Based on preliminary observations in junior Pencawan Medan, in the learning process students are not always able to understand what is conveyed by the teacher. Events that often stands out is the student less creative, less involved in the learning process, lacked an initiative and contributes both intellectually and emotionally. The fact the field of students simply memorize concepts and less able to use these concepts when working maalah matter in the form of real-life associated with the concept owned. Symptoms - symptoms like this is evidence that the problem solving ability of students to learn mathematics has not grown.

Seeing this phenomenon, it is necessary to apply a system of meaningful learning. One focus of the study of mathematics today is to increase students' mathematical problem-solving skills through problem-based learning. Problem Based Learning is centered learning strategies students who aims to form students who are active and have the ability to think analytically, systematically and logically to find alternative solutions to problems through the exploration of empirical data in order to foster a scientific attitude [7]. Students will be confronted with a problem related to their daily lives in a matter of social arithmetic so with model Problem Based Learning this students can play an active role and is able to enhance the students' mathematical problem solving ability.

### **Problem Based Learning (PBL)**

Every man in her life will always be faced with a problem that requires a skill and the ability to solve it. According to Piaget learning is not a finite process that is triggered the direction of spontaneity is limited to a single problem but an individual's cognitive structure was due to assimilation and accommodation. The importance of teaching problem solving proposed by Cooney [7] "Teaching students to solve problems - problems that allow students to be more analytical in making decisions in life". So if students are trained to solve problems then he will be able to take a decision because it has to have the skills of how to collect relevant information, analyze information and realize how necessary to re-examine the results obtained. Therefore, in the students' problem-based learning have an active role to find solutions to its problems.

Problem Based Learning is a learning problem is more emphasis on the cognitive aspects of learning students and student-centered. The focus of teaching is not so much on what students can do but to what they were thinking at the time of the study. The teacher's role in this learning often involves the presentation and explanation of something to students, but in essence the problem-based learning teachers act as mentors and facilitators so that students learn to think and solve problems in their own way.

[5] suggests, there are five main characteristics of learning based on problems that pengajun problems or questions, links with other disciplines, investigations authentic, produce and exhibit, and collaboration. Traits - traits can be explained as follows:

#### 1. Submission of an issue or statement

[5] argues, the situation permasalahan good at least meet the following criteria:

- a. Authentic, the problem must be in accordance with real-world experience of students and the student experience than to principle - the principle of a specific academic discipline.
  - b. Mystery, that problem should be a mystery or puzzle - puzzle. The problem should provide a challenge and not only has a simple answer, as well as alternative solutions require that each - each has advantages and disadvantages.
  - c. Meaningful, that the given problem should be widespread, making it possible achieve the learning objectives, meaning that the problem in accordance with the time, space, and resources available. In addition to the problems that had been developed should be based on learning objectives that have been set.
  - d. Helpful, ie problems that conceived and formulated to be beneficial for the students as problem solvers and teachers as a troublemaker. Useful problem is a problem that can improve the ability to think and solve problems of students, and raise students' motivation.
- #### 2. Links with other disciplines

In problem based learning should be the presenting problem related and involve a variety of disciplines.

#### 3. An authentic

Students in inquiry-based learning problems should be able to do a real investigation to find the real settlement of the complex problems given. Given the complex issues should be a real issue, it is meant to motivate or encourage students to complete. Investigation methods are used, depending on the problem being studied. Students analyze and define problems, develop and suspect hypotheses, collect and analyze information, carry out experiments, make conclusions and represent the final outcome.

#### 4. Produce and exhibit

Problems based learning problems, students in charge of preparing the research results in the form of work (writing or completion) and showcase their work. Each group presents the results of work in front of the class, then other groups provide feedback or criticism in this case the teacher directs and me, instruct students to be more focused student activity.

#### 5. Collaboration

In problem-based learning, task - the task of studying the form of a solved problem together - together among students by students, in pairs or in small groups, and together - together Santar students and teachers.

### **Problem Solving Ability**

A question would be a problem if the question suggests a challenge that can not be solved by a routine procedure (*routine procedure*) is already known by the offender [2]. The above definition implies that a problem should contain the "challenge" and "not yet known routine procedure". Here is a matter of routine procedure that completion was predictable, known formula, and only one or two steps matter has been resolved. Not all questions are an issue. For someone a question can be a problem for others were not. Problem solving ability is the process of applying the previously obtained knowledge into new situations that have not been known.

By Polya, there are four steps in solving the problem, namely:

#### 1. Understanding the problem

In this activity does is to formulate: what is known, what is being asked, whether information sufficient, condition (condition of) what should met, restate the original problem in a more operational form (solved)

#### 2. Planning solution

Activities carried out in this step is trying to find or recall issues you've solved that has similarities with

the properties that will be solved, look for patterns or rules, arrange settlement procedure.

3. Implementing the plan

Activities in this step is to run a procedure that has been created in the previous step to get a settlement.

4. Re-examine the procedures and results of the completion of

activities in this step is analyzing and evaluating whether the procedures applied and the results obtained are correct, whether there are other procedures that are more effective, whether the procedure is made adapat used to solve similar problems, or whether the procedure can be made generalizations.

RESEARCH OBJECTIVES

The objectives of this study are implemented to improve student math problem-solving skills through problem-based learning models or *Problem Based Learning* on Social Arithmetic material in class VII Junior High School Pencawan Medan.

II. METHODOLOGY

Location and Time Research

This research was conducted in Junior High School Pencawan Medan is located at Jl. Nicole Flowers No. 50 Padang Bulan, Medan. The research was conducted on a semester in class VII Pencawan Academic Year 2013/2014

Subject and Object of Study

Subjects were students of class VII-1 junior Pencawan Academic Year 2013/2014 consisting of 30 students. As for the object of this study is the application of learning models based on the problem to improve mathematical problem solving ability of students on Social Arithmetic material in class VII Pencawan.

Type of study

In accordance with the type of research that the problem is classroom action research (*Classroom Action Research*) with two cycles.

Tool Data Collectors

Instruments used to obtain data is a test and observation sheet. Problem solving ability test in this study consists of matter in the form of essay test. This test is used to measure the resulting increase in students' mathematical problem solving ability. This test consists of the first problem-solving ability test (after administration of the first act) and problem solving ability test II (after administration of the second act).

Observations made there are two types of observation on researchers and students. This observation was conducted to

determine the extent to which the implementation of learning mathematics by using contextual learning to improve student understanding of mathematical concepts have been implemented and to determine the activities of students during the learning process.

III. RESULTS AND DISCUSSION

Of the 30 students were given a final test on the first cycle, 15 students or 50% achieved level ketuntasa learning, while 15 students or 50% did not reach the level of completeness (scored under 70) with a value - average grade reaches 68.25% with a level of ability as illustrated in Table 1 below.

Range	level of ability	Students	Percentage of Number of Students (%)	Ability Average Value
90 – 100	Very high	1	3,33%	27,3 (68,25%) Medium
80 – 89	High	7	23,33%	
70 – 79	Medium	7	23,33%	
60 – 69	Low	8	26,66%	
0 – 59	Very Low	7	23,33%	

Table 1. Description of Student Ability in Cycle I

Yet achieved mastery learning and still are difficulties experienced by students in solving test problem-solving abilities I, hence the need for the second cycle to troubleshoot problems that occur, so expect the second cycle later students more easily understand the arithmetic of social and able to complete the application in the form of matter -soal given.

Range	level of ability	Students	Percentage of Number of Students (%)	Ability Average Value
90 – 100	Very high	15	50%	84,75 (86,67%) High
80 – 89	High	9	30%	
70 – 79	Medium	2	6,66%	
60 – 69	Low	4	13,33%	

Table II. Description of Student Ability in Cycle II

Of the 30 students 26 people or 86.67% to reach the level of mastery learning with the average - average 84.75 with details of 15 people or 50% of very high ability, 9 or 30% of high ability, 2 or 6.66%-skilled , while 4 people or 13.33% did not achieve the level of mastery learning.

Based on the description of the problem-solving ability test II above can be seen in mathematical problem solving ability of students increased from the previous. It can be seen from:

- The presence of added value - average grade obtained by students. The average value obtained in the test class problem-solving abilities I amounted to 68.25 while the second problem-solving ability test average value obtained at 84.75. So obtained an increase in value of the average grade of 16.5.
- An increasing number of students who achieve a score of  $\geq 70$ . In mathematics problem solving ability test first the number of students who achieve a score of  $\geq 70$  as many as 15 students (50%), whereas in problem solving ability test II the number of students who achieve a score  $\geq 70$  were 26 students (86, 67%). In order to obtain an increase in the number of students reached as much as 26.67%.

From the results of the second test problem solving abilities gained 26 of the 30 students (86.67%) have achieved mastery learning (values  $\geq 70$ ), while four other students (13.33%) have not been completed. Of the 30 students, there were 15 students received grades between 90-100, 9 students scored between 80-89 categorized students with high ability, two students received grades between 70-79 categorized students with the ability to moderate, and 4 students received grades between 60- 69 categorized students with low ability. Class average value obtained was 84.75. This achievement has reached an average of students' mathematical problem solving ability and a minimum of 70 students in classical mastery of at least 85%. This proves that the mathematical problem solving ability of students in the subject matter of social arithmetic has increased from the first cycle to the second cycle.

Based on observations of teachers in the first cycle that the implementation of learning that teachers are already quite good because the average value of observation of each meeting that is in the interval being 2.56%. The results obtained by the student observation that students in learning activities is still quite enough for the average value of the results of observation of each meeting is in the interval from 1.6 to 2.5.

Based on observations of teachers in the second cycle, found that teachers have been able to improve the implementation of learning by using model based problem. This is evident from the results of observations on the second cycle which has increased from the observation in cycle I. Implementation of the learning process is carried out in the second cycle teachers also have the maximum with the average being in the interval from 2.6 to 3.5 are included in the category good. Based on observations of students in the second cycle, the average value obtained is in the interval 2.6 to 3.5 are included in both categories in order to obtain that the students have been able to improve the implementation of learning activities that they follow.

Based on the results obtained that the learning model can improve students' mathematical problem solving abilities in the subject matter of Social Arithmetic class VII Pencawan Medan. Increasing students' problem-solving skills, the increase in the implementation of learning, increase in the

average value, increasing mastery of (problem solving ability) students, an increase in the percentage of individual learning completeness and thoroughness of classical study.

#### IV. CONCLUSIONS

Based on the results of research and discussion that has been described previously, it can be concluded that the implementation of learning mathematics using problem-based learning, can improve the ability of mathematical problem solving and implementation in the high category. The suggestions put forward by the research results, discussion and conclusions are as follows:

1. To the Principal advised to provide wider opportunities to teachers in the development of the implementation of learning activities in an effort to improve students' mathematical problem solving.
2. The math teacher is expected to implement the learning model based problem as an alternative learning in order to improve students' ability in solving mathematical problems.
3. To students who have not reached the level of problem-solving abilities should be more training in understanding the material arithmetic social as well as more accurate in solving problems and for students who have achieved the level of problem-solving ability to always practice harder and find new ideas in understanding and solving problems of social arithmetic.
4. For advanced researchers who want to conduct similar research is recommended to provide a time allocation for this study using more time and attention to the weaknesses that exist in research, so research done getting better.

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