THE IMPLEMENTATION OF APPROACHES IN REALISTIC MATEMATIC LEARNING TO INCREASE THE ABILITY OF THE MATHEMATICAL PROBLEM SOLVING ON STUDENTS GRADE VIII SMP SWASTA KATOLIK BUDI MURNI – 2 MEDAN

Adrina Mona H Sidabalok[1], Ida Karnasih[2], Ani Minarni[3]

[1] *College student, Graduate Program School in Mathematics Education, State University of Medan, Indonesia*
[2] *Lecturers, Graduate Program School in Mathematics Education, State University of Medan, Indonesia*
[3] *Lecturers, Graduate Program School in Mathematics Education, State University of Medan, Indonesia*

ABSTRACT

This study was conducted to increase the ability of the students o problem solving in Matemathic on students' grade VIII-A of SMP Swasta Katolik Budi Murni-2 Medan through application of learning realistic of matemathic approaches on SPLDV material. This kind of study is classroom action research (PTK) which conducted in two cycles, each performed in 2 sessions. The results of the study in the first cycle, the level of mathematical problem solving ability of the students were low category with the average score of 54.35 with a percentage of 56.25% completeness. In the second cycle, the level of mathematical problem solving ability of students high category with an average score of 69.02 with a percentage of 89.58% completeness. Based on these results, the findings indicate that using the approach Realistic Mathematics of Education (PMR) can improve students' mathematical problem solving abilities, so that the PMR approach can be used as an alternative learning.

Key words: *The ability of Matemathical problem solving, Realistic Mathematics Education*

1. INTRODUCTION

Education is the human needs that Should filled by developing the potential of Himself to Face The changes that will occur in the future. Trianto (2009) [14] state that : "Education Will support the future development Upcoming Education Is Able to develop the Learners' potential, and where relevant Capable of Confronting and solving the problems of Life Yang faces."Mathematics is a vehicle for Education that has contributed For the Future of the nation, especially the intellectual life of the nation hearts. By learning mathematic subject, the people is able to develop their ability for thinking mathematically, logic, critisize, and creative for life.

Cornelius (in Abdurrahman, 2009) [1] stated that: " there is 5 reasons of relevancy to learn mathematic subject. Because mathematic is (1) a tool to think clearly and logically, (2) the tools to solve the problems of everyday life, (3) the tools that use for knowing the correlation of patterns and generalization of experience, (4) the tools to develop creativity and (5) the medium to raise the awareness towards the development of culture. "

Learning mathematics is one of the means to develop problem-solving abilities. Problem solving is a part of the math curriculum that it is possible to gain experience using the knowledge and skills already possessed to be applied to problem solving.

Therefore, one aspect that is emphasized in the curriculum is to improve students' problem-solving abilities. This is similar to that disclosed Lerner (in Abdurrahman, 2009) [1] points out: "The curriculum subject areas of mathematics should include three elements: (1) concept, (2) skills, (3) problem solving." However, learning of mathematics is still lacking touching the substance of problem solving. The students are more tend to memorize the concepts of mathematic that students' ability to solve problems is lacking. Fewer students are able to work on the problems concerned with develope the skills and abilities to think in mathematic. According to Pimta (2009) [10] students can apply their knowledge and problem solving skills to be useful in daily life since the processes of solving the mathematic problem are similar to the general problem solving.

Based on the result of interview with one of the mathematic teacher in SMP Swasta Budi Murni-2 Medan said that the students got the difficultiness to doing some exercise in problem solving of mathematic especially on the topic that discussed about the equality system of linear and variable. The students' difficulties in doing the exercise in the form of problem solving. And also the students is difficult to interpret the problem that given in form of story into mathematics model. Whereas, the problem solving usually involve some combination of the concepts, requires the students to have ability in thinking and skills. So that, if the students were given the differences of exercises with the previous excercises , the students would get the difficulties in doing the excercies.

From the observations of the researchers for the provision of giving the tests to the students in the form of problem solving, it is clear that the students' ability in mathematical problem solving is still very low. In measuring ability in problem solving, seen from four indicators are: understanding the problem, problem-solving plan, carry out troubleshooting, and re-check. The observations showed that the students have not been able to finish the story of excerciseproblems about solving problems seen from the results of diagnostic tests students' mathematical problem solving ability is still very low with the average percentage of diagnostic tests is 32.2% and classified in the category of very less. It concluded that one of the difficulties to learn mathematics is low ability students' mathematical problem solving. To overcome these problems is necessary to improve the ability of students' mathematical problem solving. After searching on the results of observations conducted in SMP Swasta Katolik Budi Murni-2 Medan, discovered one of the causes of students' problem solving ability level is still very low at this school mathematics learning is still dominated by the use of a lecture and more teacher-centered activities. Other causes are in the learning process still seems the tendency to minimize the role and involvement of students. Supposed to be active and creative students in the learning process caused by the material interesting because it comes with pictures and stories.

The importance of problem solving ability was well advanced by Seyhan (2015) [12] "For improving problem solving abilities, it is important to guide students and provide them with feedback as well as introducing strategic methods and modeling students in utilization of these methods. According to Hudoyo (in Hoiriyah, 2104) which states that solving the problem is something that is essential in the learning of mathematics in schools, due to, among other things: (1) Students become skilled selecting relevant information, then analyze it and then examined results; (2) intellectual satisfaction will come from within, which is an intrinsic problem; (3) The intellectual potential of students increased; (4) Students learn how to perform the invention through the process of performing the invention. Thus it is natural solution to this problem should receive special attention, given the very strategic role in developing a student's intellectual potential.

By applying realistic mathematics learning, learning in the expected students will have respect for mathematics because of the contextual issues related to real life everyday, mathematical learning process does not cause boredom because it is not directly to the formal form (abstract). The language, and particularly the words 'context' and 'realistic'. Dickinson (2012) [2] "The context are not necessarily situations where the mathematics is applied to real-world problems; what is important is that they allow students to take ownership of the mathematics".

2. REALISTIC MATHEMATICS EDUCATION

The concept of learning in a realistic learning approach, the teacher brings the real world into the classroom in a way that his mathematical ideas or knowledge may arise from the realistic problems. According to Freudenthal (in Wijaya, 2012) [15] states that a knowledge will be meaningful for the students or learning process by using the realistic problems. Similar with the opinion of Panhuizen (2014) [9] "Characteristic of RME is that wealth, 'realistic' situations are given a prominent position in the learning prosess".

In mathematics realistic learning, the realistic problem which is refered to to the problem, if the problem could be imagine or real in the students' minds. After the students can visualize the problem and students can describe how settlement in accordance with their experience. This strategy was developed by students based on prior knowledge. The Teachers only assist and guide the students to make decisions. Therefore, through this realistic mathematics learning problem-solving skills students are expected to be increased to understand and resolve the contextual problems in accordance with the troubleshooting steps.

Realistic Mathematics learning is a teaching and learning theory in mathematics education. According to Freudenthal (in Wijaya, 2012) [15] there are two important things that underlie the appearance of realistic mathematics education (PMR) that is connected with the reality of mathematics and mathematics as human activity. The mathematics associated with reality will provide

meaningful learning for students. Mathematic is as an activity indicates that mathematics should not be taught to students as a finished product, but to become an activity to understand mathematical concepts.

According to Gravemeijer (Fauzan, 2002) [3] there are three key heuristic principles of RME for instructional design namely guided reinvention through progressive mathematization, didactical phenomenology, and self developed models or emergent models.

1. *Guided reinvention and progressive mathematizing*

   This principle requires that in mathematics realistic, from the contextual problem given by the teacher at the beginning of the learning, then in solving the problem of students directed and given the guidance is limited, so students experience the process of rediscovering concepts, principles, properties and mathematical formulas as when the concepts, principles, properties and mathematical formulas was found. This principle can be inspired to use informal procedures to the level of a formal study mathematics.
2. *Didactical phenomenology*

   Based on this principle of presenting the topics of mathematic contained in realistic mathematics learning is presented on two reasons, namely; (I) Raises various applications that must be anticipated in the learning process and (ii) compliance as being influential in the process of progressive mathematizing (consideration of the suitability of the contextual issues are used as points to a process of Mateatics progressive).
3. *Self-developed models*

   Based on this principle when working on contextual issues students are given the opportunity to develop their own model that serves as a bridge between the informal and formal mathematical knowledge. In completing the contextual issues, students are given the freedom to build their own mathematical models associated with contextual problems are solved. As a consequence of freedom, it is possible to appear a variety of models built student.

In Realistic Mathematics Education, learning should start from something real so that students can get involved in the learning process significantly (Hadi, 2005) [4]. The main concepts in learning mathematics is realistic significance of mathematical concepts. A student learning will be meaningless if the learning process is done in a context or learning to use the problem using realistic problems. Problems do not always interpreted realistic problems that can be experienced by students. A problem is said to be a realistic problem if the problem can be imagined or real in the minds of students. In mathematics realistic, real-world use as a starting point for the development of ideas and mathematical concepts. According to De Lange (in Hadi, 2005) [4] define the real world as a concrete real world, which is delivered to students through the application of Mathematics. Treffers (in Wijaya, 2012) [15] formulated five characteristics of Realistic Mathematics Education, namely:

1. Use of context

Context or problems realistically be used as the starting point of learning mathematics. Through the use of context, students are actively involved to conduct exploration activities issues. Exploration results, students not only aim to find a final answer to a given problem, but also aimed to develop a variety of problem-solving strategies that can be used.

2. The use of mathematical models for the progressive

In Realistic Mathematics Education (PMR), is used in performing mathematical model of progressive. The use of the model serves as a bridge (bridge) on the concrete level mathematical knowledge and mathematical knowledge to the formal level.

3. Utilization of the results of students' construction

Referring to the opinion of Freudenthal that maths was not given to students as a product that is ready to be used but as a concept built by the students in the Realistic Mathematics Education (PMR) students are placed as a subject of study.

4. Interactivity

One's learning process is not just an individual process, but also simultaneously a social process. The learning process of the students will be more concise and meaningful when students communicate their work and their ideas.

5. linkage

Realistic Mathematics Learning puts linkages between mathematical concepts as things to be considered in the learning process. Through this association, the learning of mathematics is expected to introduce and build more than one mathematical concepts simultaneously.

Based on the characteristic of realistic mathematic learning, it can be arrange the steps of learning which is use in this research, as follows :

Step 1: conditioning the students to learn.
Step 2: submited the contextual problems.
Step 3: Guiding students to solve problems in context.
Step 4: Asked the students present resolution.
Step 5: Compare and discuss problem solving.
Step 6: Directing students to draw conclusions.

3. THE MATHEMATICAL PROBLEM SOLVING ABILITY

Abdurrahman (2009) [1] says that solving the problem is the application of concepts and skills. In solving the problem usually involves some combination of concepts and skills in a new situation or a different situation. *National Council of Matematics Teachers* [8] state that to solve the problem not just as a goal to learn mathematic, but it is also the main tool to learn it. By teaching problem solving, students will be able to take a decision. This is similar to Hudojo (1988) [5] which states that teaching problem solving to students, enabling learners to become more analytical in making decisions in their life. By studying problem solving in mathematics, the students will acquire ways of thinking, industrious habits, and curiosity, and confidence in unusual situations, as well as situations that they will encounter outside the classroom mathematics.

On the technical instructions regulations Dikdasmen No. 506 / C / PP / 2004 dated 11 November 2004 on the assessment of the development of junior high school students included indicators of problem-solving skills as a result of learning mathematics. The indicators are:

1. Ability to demonstrate understanding problems
2. The ability to organize data and select relevant information in problem solving
3. The ability to present a problem in mathematics in various forms
4. The ability to choose the approach and problem-solving methods appropriately
5. Ability to develop problem-solving strategies
6. The ability to create and interpret a mathematical model of a problem
7. The ability to solve problems that are not routine.

If the observed indicators, it appears that the indicators set by the government led to measures Polya problem solving. According to Sajadi (2013) [11] devided mathematical word problem solving into four "cognitive phases": translating, integrating, planning and execution. Step process of mathematical problem solving by Polya (in Tarigan, 2006) [13], namely:

1. Understanding the Problems.

Activities to do in this step is the identification of what (data) is known, the identification of what is going to be sought, whether the information sufficient, condition (condition) must be met.

2. Planning Troubleshooting

Activities to do in this step is: try to find or remember ever solved a problem that has similarities with the problem to be solved, look for patterns or rules, arrange settlement procedure.

3. Implement the plan settlement issues

Activities to do in this step is: running a procedure that was created in the previous step to the settlement.

4. Re-examine settlement procedures

Activities to do in this step is: check the result by substituting in the model answers to the problem; if this substitution process to produce a statement that is true, then the answer is generated is also true.

The scoring of problem-solving ability is applied by researchers to answer students' adoption by Mona (2015) [7], which are summarized in Table-1 below:

Table-1: The Alternatif of giving Skor in problem solving

Assesment	Score	Explanation
Understanding the problem	0	Do not understand the problem at all.
	1	Do not understand some of the problems or misinterprete some of the problems.
	2	Understanding the problem is complete
Planning the solution	0	There is no effort at all
	1	Most of the planning is correct
	2	Planning is complete and correct and leads to the correct solution
Determine the answer	0	There is no answear or the answer is wrong
	1	Miscount of the mathematics / a set of answearing
	2	The right answer and complete

4. RESEARCH METHODS

This research is a classroom action research (classroom action research) by applying realistic mathematics learning approaches undertaken with the aim of improving the quality of learning in the classroom. In accordance with this type of research, this study has the stages of the research is a cycle. The research was conducted in SMP Swasta Katolik Budi Murni 2 Medan. Subjects in this study were students of class VIII SMP Swasta Katolik Budi Murni 2 Medan in Academic Year 2013/2014. Which is the object of this study is the level of students' mathematical problem solving abilities by applying realistic approach to mathematics learning in class VIII SMP Swasta Katolik Budi Murni 2 Medan.

In accordance with this type of research is the Classroom Action Research (Classroom Action Research), the study has a phase or cycle. In this study, if the first cycle is not successful, the mathematical problem solving ability of students not achieve mastery, then held the second cycle. Cycle will stop when satisfied that research targets are 85% of students have achieved the category-level problem solving skills were minimal. Research procedures are the stages with a set of activity data collection tool and a learning tool. These stages as follows:

CYCLE I

1. Problems I

To find out the existing problems, do a diagnostic test as much as 4 questions that aims to see the problem solving ability of students on the material sub systems of linear equations of two variables. Based on preliminary tests are given, obtained some of the difficulties faced by students in solving problems troubleshooting.

2. Action Planning Phase I

The activities carried out in the planning phase of this action are:

a. Develop a lesson plan (RPP) which contains steps in learning activities that use realistic mathematics learning model.

b. Preparing a learning support tool that supports the implementation of the measures, namely: (1) The student worksheet, (2) the book for the researchers that contains learning scenarios

c. Prepare research instruments, namely: (1) a test to see how the students' ability to solve problems, (2) the observation sheet to observe the activities (processes) learning.

3. **Implementation of Measures I**

After the first action plan drawn up with mature, the next step is the implementation of the action I, as follows:

a. Perform the learning activities will be grouped two meetings (4 x 40 minutes). At each lesson plan (RPP) by applying realistic mathematics learning model in solving problems with the help of appropriate learning method based learning scenarios which have been prepared researcher.

b. At the end of the first act of the students were given a problem-solving ability test I done individually which aims to determine the level of problem-solving ability of students after a given action on cycle

4. Observation I

Observations made at the same time during the implementation of the act of learning in order to determine whether the conditions of teaching and learning has been implemented according to design lesson plan by applying realistic mathematics learning as an effort to improve students' problem-solving abilities. Observations carried out based on the observation sheet. This stage is very important and requires careful observation and patience in order to provide feedback for improvement in the next cycle.

5. Data Analysis I

Data obtained from tests of mathematical problem solving ability of students were analyzed after the calculation to obtain the results of the tests students' problem-solving abilities.

6. Reflection I

Results obtained from the stage of actions and observations were collected and analyzed at this stage, so that the conclusions obtained from the action taken. The result of this reflection is then used as the basis for the planning stage in the next cycle.

CYCLE II

If the expected results have not been achieved in the first cycle, the action still needs to be continued into the second cycle. In the second cycle of planning are repeat again by referring to the results of the reflection on the cycle I. In the second cycle, there is a result of the unity of planning, action, observation, and data analysis, and reflection as was done in the first cycle by paying attention to what things are to be a problem in cycle I.

5. RESULT OF THE RESEARCH

Results of the research described in this section include the results of tests and nontes. The results of the test consists of diagnostic tests, problem solving ability test cycle I (TKPM I) and problem solving ability test cycle II (TKPM II), while the results non-test form of the observation sheet. Subjects in this study were students of class VIII-A SMP Swasta Katolik Budi Murni 2 Medan as many as 48 students. Before giving action, previous students are given a diagnostic test in the form of a problem as a reference picture of the ability of students / research subjects in solving the problem and for the division of student discussion team. The diagnostic test consists of four questions with the material system of linear equations of two variables. Based on the results of diagnostic tests obtained reference picture of the ability of class VIII-A of SMP Swasta Katolik Budi Murni – 2 Medan in solving mathematical problems. The average percentage TKPM was 32.2% and classified in the category of very less. Based on the completeness criteria troubleshooting, diagnostic test results showed that no single complete student in mathematical problem solving.

Percentage of mathematical problem solving ability of students to each indicator and each item matter presented in the following table:

Table-2: The Percentage ability test to solve the problems (TKPM I)

No	The steps to solve the problems	The items of question	TKPM I			Categories
			The Students score	Total score	Precentage	
1	The ability to understand the problems	1,2,3,4	426	576	73,96%	Good
2	The capabilities of planning to solve the problems	1,2,3,4	808	1152	70,14%	Good enough
3	The ability to do the planning in problem solving	1,2,3,4	1158	1728	67,01%	Good Enough
4	Reviewing Solutions Provided	1,2,3,4	228	384	59,37%	Good enough

Table-3: The Percentage ability test to solve the problems (TKPM II)

No	The steps to solve the problems	The items of questions	TKPM 1			Categories
			The Students score	Total score	Precentage	
1	The ability to understand the problems	1,2,3,4	525	576	91,15%	Good
2	The capabilities of planning to solve the problems	1,2,3,4	1004	1152	87,15%	Good enough
3	The ability to do the planning in problem solving	1,2,3,4	1475	1728	85,36%	Good enough
4	Reviewing Solutions Provided	1,2,3,4	300	384	78,12%	Good enough

CYCLE I

Based on observations and mathematical problem solving ability test cycle I, the following describes the reflection result in the implementation of the action during the first cycle of learning, namely:

1. In terms of research activities in the implementation of the learning, researchers are still lacking in master classes, still less appropriate to split the group learning, still less to motivate students to be active in discussion groups, they are less able to guide students in working groups well.
2. In terms of student activities, there are still students talking in class when the teacher started to lead the students to understand the material, there are members of the group who did not participate / less serious in doing worksheets, students pay less attention when the presenter presents the result of group discussion in front of the class, It can be seen from the results of mathematical problem solving ability test first cycle is still low and has not yet reached complete learn classical.
3. In terms of results TKPM I, the results are as follows:
   a. In step understand the problem, there are still many students who are not able to describe the problem well. From the results TKPM I data showed that the classical students' skills in understanding the problem has reached 73.96% is included in both categories.
   b. In step plan settlement issues, there are still students who did not write down what will be done in planning for problem solving. From the results TKPM I data showed that the classical students' skills in problem-solving plan still reached 69.62% included in the category quite well.
   c. In steps resolve the problem, students are less thorough in completing. From the results TKPM I data showed that the classical students' ability to solve problems according to plan still reached 66.84% included in the category quite well.
   d. On the re-check the steps, there are students who do not check the results already obtained, there are even students who did not write the conclusion of a given problem. From the results TKPM I data showed that the classical student's ability to re-examine the results of the settlement procedure is still reached 57.81% included in the category quite well.

Based on the completeness criteria to apply problem-solving approach to the material Realistic Mathematics Education system of linear equations in two variables, I TKPM results showed that as many as 27 students have completed in solving the problem so that the percentage of the class has been able to solve the problem (DSK) is 56.25%. This indicates that the class was not finished in solving problems. These results are in accordance with the classical completeness ≥ 85%, so that the necessary corrective action to the second cycle.

CYCLE II

Based on the observations and mathematical problem solving ability test on the cycle II, the following is obtained descriptions of students' skills in problem solving. Percentage of students 'ability to understand the problem reached 91.15% and classified in the category very well, the percentage of problem solving ability of students to plan 87.15% and classified in the category very well, the percentage of students' ability to implement the plan troubleshooting 85.36% and classified in the category of very well, the percentage of students' ability to review the solution obtained 78.12% and classified in either category. Based on the completeness criteria troubleshooting, TKPM II results showed that as many as 43 students have completed in solving the problem so that the percentage of the class has been able to solve the problem (DSK) is 89.58%. This indicates that the class has been completed in solving problems.

6. CONCLUSION

Based on the result of this research is, it can be concluded that the increase in mathematical problem solving ability of students to use Realistic Mathematics Education in classical 33,33% is 56.25% in the first cycle to 89.58% in the second cycle.

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