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# THE INFLUENCE OF REALISTIC MATHEMATICS EDUCATION (RME) APPROACH TO MATHEMATICAL PROBLEM SOLVING ABILITY IN SMPN 17 MEDAN

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**Abstract-**The purpose of this research was to determine whether the RME approach can improve the mathematical problem solving abilities of students on the material Social Arithmetic and how the process of the students' answers in solving the problem. This research population was all students of class VII in SMP Negeri 17 Medan, while samples in this study were 33 students of class VII-4 are taught to RME approach. The method used is the t-test. Analysis t-test were*was used, with sig tcount 15.577. 0,000, so it was concluded that the use of RME approach can improve mathematical problem solving ability of students. From the process students' answers, be concluded that students have started to understand the problem and solve the problem is well* problem solving well, but students are*were still *have* difficulties in determining the problem-solving strategies, *beside of that the student didn't do the recheck for their working.*

***Keywords***: realistic mathematics education (RME) approach, problem-solving ability

## 1. INTRODUCTION

The importance has of problem solving ability by students in mathematics, according [1] argued that problem solving in school mathematics can be viewed as a goal, a process, or as a basic skill, with each interpretation having different implications for teaching and learning problem solving. Another factor contributing to ambiguity about problem solving is that what constitutes a mathematical problem is relative to the solver. [8] traced the role of problem solving in school mathematics and illustrated a rich history of the topic. To many mathematically literate people, mathematics is synonymous with solving problems-doing word problems, creating patterns, interpreting figures, developing geometric constructions, proving theorems, etc. On the other hand, persons not enthralled with mathematics may describe *any* mathematics activity as problem solving.

The Singapore Mathematics Curriculum Framework (SMCF) has mathematical problem solving as its central goal since the early 1990s. The framework asserts that to develop students to become good mathematical problem solvers, it is dependent on five inter-related components, namely, the development of skills, concepts, attitudes, metacognition, and processes [2].

The importance of problem-solving ability in mathematics learning Sumarmo expressed by stating that the learning approach emphasizes the things that confront students practice doing the problem-solving and analytical thinking. The same opinion was expressed by [9] which says that the problem-solving ability important role in learning mathematics. Students' skills in problem solving can be seen from the aspect of conceptual knowledge / procedural, strategy, communication and accurate. According to [7] one of the problems confront our education is the weakness of the learning process. In the process of learning, children are less encouraged to develop the ability to think. The process of learning in the classroom is still directed at the child's ability to memorize information, the brain is compelled to understand the information that is remember to connect with daily life

The [6] has strongly endorsed the inclusion of problem solving in school mathematics. There are many reasons for doing this. First, problem solving is a major part of mathematics. It is the sum and substance of our discipline and to reduce the discipline to a set of exercises and skills devoid of problem solving is misrepresenting mathematics as a discipline and shortchanging the students. Second, mathematics has many applications and often those applications represent important problems in mathematics. Our subject is used in the work, understanding, and communication within other disciplines. Third, there is an intrinsic motivation embedded in solving mathematics problems. We include problem solving in school mathematics because it can stimulate the interest and enthusiasm of the students. Fourth, problem solving can be fun. Many of us do mathematics problems for recreation. Finally, problem solving must be in the school mathematics curriculum to allow students to develop

the art of problem solving. This art is so essential to understanding mathematics and appreciating mathematics that it must be an instructional goal.

The present from learning mathematics is still a lot of learning using ordinary of conventional approach. It can be seen from the characteristics of the learning usual, namely: (1) by submitting the material verbally, meaning that teachers speak verbally, so they can be identified with lectures, (2) the learning material presented is a subject matter that is so, such as data or facts , certain concepts to be memorized so that does not require students to think again, and (3) the principal purpose of learning is mastery of the subject matter itself. That is, after ending learning process students are expected to understand correctly the way back the material can reveal who had already outlined.

Based on the characteristics, it can be concluded some weakness this study are: (1) this strategy cannot serve the differences of each individual are different abilities, different knowledge, interests, talents, and differences in learning styles, (2) because more give speeches, then difficult to develop students 'skills in terms of social skills, interpersonal relationships, as well as critical thinking skills, (3) for one-way communication style (one-way communication), then the chance to control the students' understanding of the learning material will be very limited.

Based on some of the above description, the teacher should must reduce of dominance in the classroom by applying the learning that can be training students to discover and construct their own knowledge. By providing broader opportunity for students to interact with their friends study, then by itself will training students improve the ability understanding, communication, connections, reasoning, and problem solving.

One of the learning strategies that can effectively to increase the problem solving is Realistic Mathematics Education (RME) approach. Realistic mathematics education is a theory in mathematics education that is originally developed in the Netherlands. It stresses the idea that mathematics is a human activity and mathematics must be connected to reality, real to the learner using real-world context as a source of concept development and as an area application, through process of mathematization both horizontal and vertical.

The present form of RME is mostly determined by Freudenthal's view on mathematics [4]. Two of his important points of views are mathematics must be connected to reality and mathematics as human activity. First, mathematics must be close to children and be relevant to daily life situations. However, the word ‘realistic’, refers not just to the connection with the real-world, but also refers to problem situations which are real in students' minds. For the problems to be presented to the students this means that the context can be a real-world context but this is not always necessary. [3] stated that problem situations can also be seen as applications or modeling.

Second, the idea of mathematics as a human activity is stressed. Mathematics education organized as a process of Guided Reinvention, where students can experience a similar process compared to the process by which mathematics was invented. The meaning of invention is steps in learning processes while the meaning of guided is the instructional environment of the learning process. For example, the history of mathematics can be used as a source of inspiration for course design. Moreover, the reinvention principle can also be inspired by informal solution procedures. Informal strategies of students can often be interpreted as anticipating more formal procedures. In this case, the reinvention process uses concepts of mathematization as a guide.

Two types of mathematization which were formulated explicitly in an educational context by [12] are horizontal and vertical mathematization. In horizontal mathematization, the students come up with mathematical tools which can help to organize and solve a problem located in a real-life situation. The following activities are examples of horizontal mathematization: identifying or describing the specific mathematics in a general context, schematizing, formulating and visualizing a problem in different ways, discovering relations, discovering regularities, recognizing isomorphic aspect in different problems, transferring a real world problem to a mathematical problem, and transferring a real world problem to a known mathematical problem. On the other hand, vertical mathematization is the process of reorganization within the mathematical system itself. The following activities are examples of vertical mathematization: representing a relation in a formula, proving regularities, refining and adjusting models, using different models, combining and integrating models, formulating a mathematical model, and generalizing.

Based on the above phenomenon, the author is interested in conducting research on the application of RME approach which are expected to increase students' in mathematical problem solving ability because in this study is presented a concept which relates the lessons learned students

with the context in which such material is used, as well as dealing with how a person learning or style / student learning. The subject matter will increase mean if students learn the subject matter presented in the context of their lives, and find meaning in the learning process, so learning will be more meaningful and fun.

Realistic Mathematics Education (RME) is a teaching and learning theory in mathematics education that was first introduced and developed by the Freudenthal Institute in the Netherlands. This theory has been adopted by a large number of countries all over the world such as England, Germany, Denmark, Spain, Portugal, South Africa, Brazil, USA, Japan, and Malaysia [3].

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[4] stated that "horizontal mathematization involves going from the world of life into the world of symbols, while vertical mathematization means moving within the world of symbols." But he adds that the difference between these two types is not always clear cut.

Figure 1 illustrates the process of reinvention. It shows that both the horizontal and vertical mathematization take place in order to develop basic concepts of mathematics or formal mathematical language.

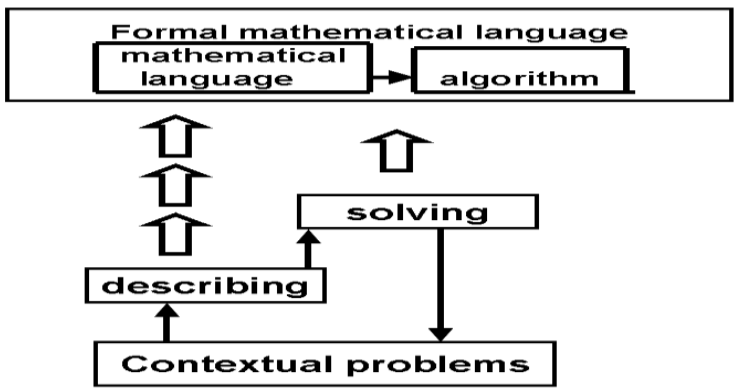


**Figure 1.** Guided Reinvention model [5].

The learning process starts from contextual problems. Using activities in the horizontal mathematization, for instance, the student gains an informal or a formal mathematical model. By implementing activities such as solving, comparing and discussing, the student deals with vertical mathematization and ends up with the mathematical solution. Then, the student interprets the solution as well as the strategy which was used to another contextual problem. Finally, after the student has used the mathematical knowledge.

The combinations of the three Van Hiele's levels, Freudenthal's didactical phenomenology and Treffers' progressive mathematization results in the following five basic characteristics of realistic mathematics education: (1) phenomenological exploration or the use of contexts; (2) the use of models or bridging by vertical instruments; (3) the use of students own productions and constructions or students contribution; (4) the interactive character of the teaching process or interactivity; and (5) the intertwining of various learning strands.

## 2. METHODS

The population in this research is all students of class VII SMP Negeri 17 Medan academic year 2015/ 2016. There are eight classes VII to the number of students as many as 285 people. The sampling technique used in this study is simple random sampling. With this technique, the sample is a class VII-4 which consists of 33 students. Data collection tool used in this research is to test students' problem solving ability after taught using realistic mathematics education approach.

There are two types of tests that give the pre-test and post test. Pre test is given before the learning process a mean to know students' prior knowledge. Whereas the post test was given after the learning process a mean to know students' problem-solving abilities after being treated. These results are used to seeing the success of learning. The test comes in the form description in order to know the answers of students in solving the problems. Steps to resolve the problem Polya become a reference in solving these steps because the most technically equipped than other problem solving steps.

This research was aimed to reveal whether there is an increased problem-solving ability of students after taught using RME approach. Further purpose is is to analyze the responses of the students in solving problems related to mathematical problem solving ability of students on material Social Arithmetic s. The average problem-solving skills are taught to students before RME approach or the value pretest students was 20.15 with a standard deviation of 16.309. Having taught the RME approach to problem-solving ability of students or posttest value increased 33.93 points to 54.09 with a standard deviation of 16.12.

## 3. RESULTS AND DISCUSSION

The average of mathematical problem solving ability of student before taught by RME approach or pretest value of student was 20,15 with standard deviation is 16,309. After taught by RME approach has increasing mathematical problem solving ability or posttest value has increasing is 39,93 point to be 54,09 with standard deviation 16,12.

**Table 1.** Data deskriptif statistik pretest dan postest descriptive statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| pre_test | 33 | ,00 | 52,50 | 20,1515 | 16,30926 |
| post_test | 33 | 30,00 | 82,50 | 54,0909 | 16,12716 |
| Valid N (listwise) | 33 | | | | |

Comparison of pretest and post-test value and standard deviation of each is shown in the Figure 2.

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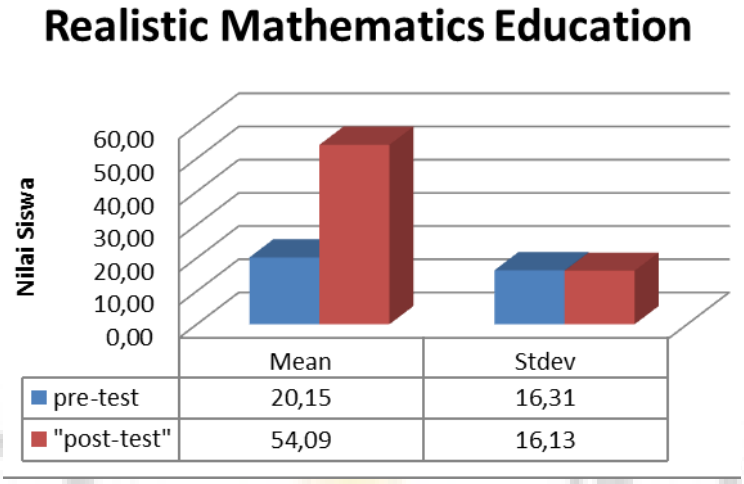



The next process is to calculate the value of gain. The results of the calculation descriptive the value of gain after treatment by SPSS are shown in the Table 2.

**Table 2.** The descriptive gain one-sample statistics

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Gain | 33 | ,4299 | ,15855 | ,02760 |

Average value of gain mathematical problem solving ability of students was 0.429 with a standard deviation is 0.158. The hypothesis is an increase in mathematical problem solving ability of students after taught using RME approach. T test results obtained by using SPSS shown in Table 3.

**Table 3** results data analysis with t-Test

**One-Sample Test**

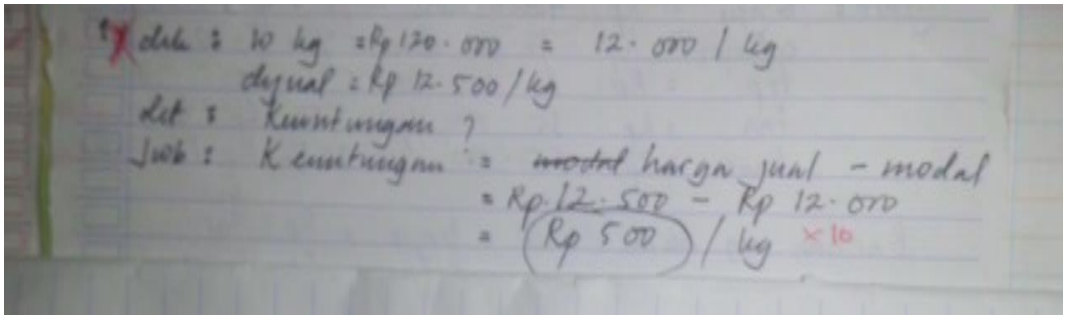
| | Test Value = 0 | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 95% Confidence Interval of the Difference | |
| | t | df | Sig. (2-tailed) | Mean Difference | Lower | Upper |
| Gain | 15,577 | 32 | ,000 | ,42991 | ,3737 | ,4861 |

Based on the above Table, t-count for test the hypothesis is 15.577 with sig. 0,000. Based on these values we concluded that Ho is rejected, it means that there is an increase in mathematical problem solving ability of students taught using RME approach on material Social Arithmetic s.

### 3.1 Variations Answers

There are some variations of student answers in solved problem-solving abilities.

a. Problem Number 1



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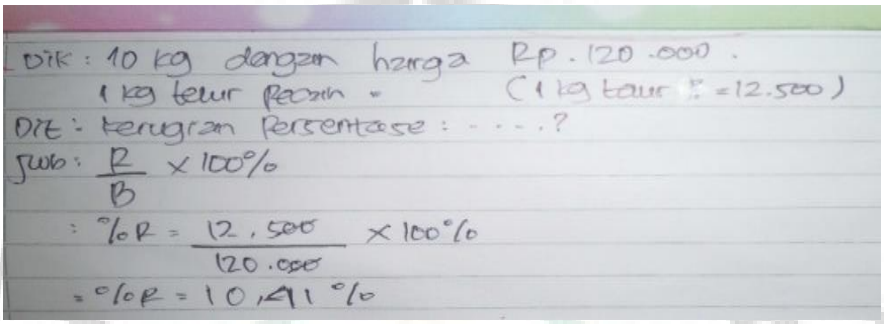
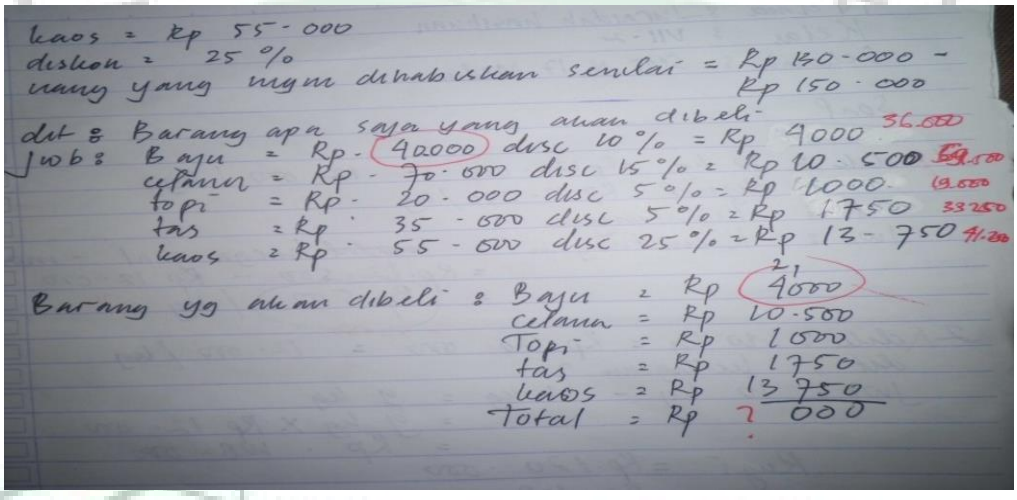
Variation of the first answer, the students understand the problem with the retelling of a given problem with the language itself. Students also expressed the adequacy of the data appropriately. But on the calculation of students is not consistent with the strategy chosen. Looking back of the steps to resolve the problem was not done correctly. But students are not consistent due to the implementation of the strategy to do is change the price per kg.

b. Problem Number 2



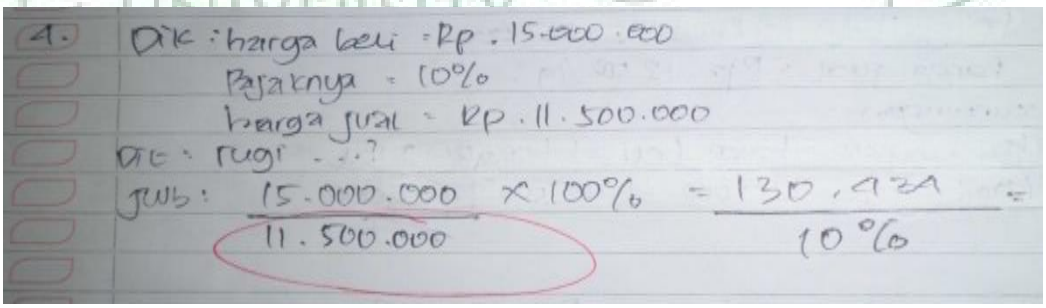

Variations second answer, the students write down the things that are known and asked with correct but incomplete. The adequacy of the data to be answered correctly. The strategy chosen is correct is to look% loss. But students can not answer the question correctly.

c. Problem Number 3




Variations in the third answer, the students wrote are known, and asked the adequacy correctly. But the students forgot to subtracting discount. So students can not answer questions correctly and determine what items can be purchased.

d. Problem Number 4




Variations fourth answer, students had to write things that are known with be true, but still wrong in determining the adequacy of the data. They also still have difficulty in writing a problem-solving strategies. Students forget to look for capital, so that the answers obtained is not correct.

### 3.2 Description

Based on the results of research that has been described previously, then the next will be described RME approach that influence of mathematical problem solving ability of students.

**The increasing of mathematical problem solving**

Results of the research are analyzed showed that the mathematical problem solving ability of students increased as taught by RME approach. Theoretically RME approach has advantages over the usual lesson. These advantages are:

According [11] there are some strengths or advantages of realistic mathematics learning, ie.

1. Learning realistic mathematics give students a clear understanding of the relevance of mathematics to everyday life and usability in general for humans.
2. Learning realistic mathematics provide a clear understanding to the students that mathematics is a field of study that is constructed and developed by students not only by so-called experts in the field.
3. Realistic mathematics learning gives students a clear understanding that the way of solving a problem or issue should not be single and not necessarily equal to one with the other. Everyone can find or use their own way, so long as that person seriously work on the problems or the problems. Furthermore, by comparing the way the completion of one another by way of settlement, would be gained most appropriate way of settlement, in accordance with the objectives of the problem solving process.
4. Learning realistic mathematics provide a clear understanding to the students that in the study of mathematics, the learning process is the main thing and people have to undergo the process and trying to find their own mathematical concepts with the help of others who know better (eg teachers). Without the willingness to undergo the process yourself, meaningful learning can not be achieved.

**Variation the answer of mathematical problem solving ability student**

Based on variations in students' answers, the students can understand the problem, although some are still incorrect or incomplete write is known, asked and the adequacy of the data. Students are seen still difficulties in writing down problem-solving strategies that will be used to solve mathematical problems. It is seen from some variation of students who showed the students directly resolve the problem without writing strategies to use or write a strategy but to solve the problem in a different way with the strategy that has been predetermined. In the looking back the completion of the steps that have been written, some students still do not verify correctly. It is manifested in existence of errors at a certain step and answers that are not logical from results.

However, the average mathematical problem solving ability of students in social arithmetic increase following RME approach learning. The results showed that all previous mathematical problem solving ability of students in a category is very low, be increased in the low category (students), medium (students) and high (students).

## 4. CONCLUSIONS

Based on the results of research can be obtained some conclusions, namely: (1) RME approach can improve mathematical problem solving abilities students in material Social Arithmetic in class VII SMP Negeri 17 Medan; and (2) Based on the variation of student answers in solving mathematical problems given, the students ability to the planning aspects of problem-solving strategies and looking back still low. Generally, the students ability in aspect understanding of the problem has to look good because students can write the known, asked and the adequacy of the data on their answers.

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