

CHAPTER I INTRODUCTION

1.1 Problem Background

Education world is still bumped into many problems, especially education world in Indonesia. And unconscious, the problems appear are effected quality of Indonesian education also from bad to worse. This thing is proved by Indonesian is got in 33rd position of 45 countries in Third International Mathematics Sciences Study (TIMSS) in 2003. In 2006, Program for International Students Assessment (PISA), that it gives score to how well immediacy of students 15 years old in facing life, Indonesian get level 50 of 57 countries in sciences, reading, and mathematics (The world Bank, 2011). This fact proof that there is not an appropriate evaluation yet, about whether problem that is really happened.

Unconsciously, one of the basis problem of Indonesian education world is education paradigm mistake that base all of education implementation systems. Still many used traditional method in learning system cause the quality of education become low, and finally student's achievement has not improved. Why it can be called like that? It is because the use of traditional method such as conventional learning method not make student as learning subject. Student is more accepted lesson than acting to find the knowledge. This thing also happens in mathematics learning in Indonesian. Whereas, based on the appendix of National Minister of Education rules (Permendiknas) Number 20 year 2006 about standard of content (Wijaya, 2012 : 16), said that mathematics learning has goals, namely:

- 1) Understanding mathematics concept, explaining intertwine inter concept and applying concept or algorithm, flexible, accurately, efficiently, and appropriately in problem solving.

- 2) Using reasoning in pattern and characteristic, doing mathematics manipulation in generalizing, arranging proof, or explaining idea and mathematics statement.
- 3) Problem solving that include understanding problem ability, designing mathematical model, solving model and conjecturing solution that is gotten.
- 4) Communicate idea with symbol, table, diagram, or other media to make clear situation or problem.
- 5) Have attitude appreciate mathematics use in life, namely have curiosity, attention, and interest in learning mathematics, and tough attitude and self-confidence in problem solving.

Based on the goal of mathematics learning, can be said that learning mathematic not only enough be able to do calculation in mathematic, but must be mathematics learning become meaningful learning where students can use his ability and curiosity independently, and not look mathematics as an abstract thing. Mathematics should be able to imagined by student, so that student can understand mathematics concept well. In the meantime, Keith Delvin is presented the four faces of mathematics, namely; (1) mathematics as computation, formal reasoning, and problem solving; (2) mathematics as a way knowing; (3) mathematics as a creative medium; (4) applications of mathematics (NCTM, 2000:16).

From the four faces of mathematics above, one of ability that so hoped to appear by learning mathematics this time is reasoning ability. Reasoning ability is one of very important competence that students must have it in achieving optimal mathematics learning outcome. Reasoning activity, many involve student's critical thinking ability in facing a problem. Improving reasoning ability means that improving student's ability in submits conjecture, take conclusion based on the fact and relevant source, doing mathematics manipulation, and generalizing.

Mathematical reasoning is one of method that is given to develop students' perception about phenomena. A person that reasoning and his thinking is

analytic inclined record pattern, structure, and regularity in real world and symbolic things. He will give question whether the pattern is accidentally, whether it has reason so that easy to conjectured and proved. Mathematical reasoning process must be invested to students early. From students' experience early with mathematics, important to help them to understand mathematics that statement always has a reason. Such as question "Why do you say that it is true?" and "Is there one of you have another answer?" will help students look up that the question need proof. In addition, while the evidence can be received logically, thus it will become an enough argument in mathematics class. This thing will become the first step to realize that mathematical reasoning is based on assumptions and specific rules latter. Thereby, mathematical reasoning is a mind habitual like other habit. Therefore, it must be developed consistently using various context, know both of reasoning and authentication are fundamental aspects in mathematics.

From the interview with Mrs. Eliyati, one of teacher mathematics in SMP NEGERI 1 MEDAN, explain that students mathematical reasoning ability in SMP NEGERI 1 MEDAN are not smooth yet. Still many students have low mathematical reasoning ability. Its impact is seen in national examination that still not enough high yet. This thing is caused by learning implementation not many engaging students yet. Therefore, very important a learning activity that invite students many involve, thinking much of and more motivated to learn mathematics.

One of mathematics matter that needs reasoning ability is fraction. Fraction is one of important matter in mathematics hoped that can be expert by student according to education curricula in Indonesia. Because, fraction included the basic concept and a prerequisite matter to learning and understanding other kinds of number such as real number and complex number. Another, fraction also very needed by student to develop algebra reasoning ability in the next class (Yusof & Malone, 2003), and to develop problem solving ability especially in algebra, and probability in statistic (Clarke, Mitchell, and Roche, 2007) in Wahyu (2010). In the intermediate grades, the main emphasis will be on extending the

concept of the fractional number and equivalent fractions and on developing the operations of addition and multiplication along with their respective inverses (D'augustine, 1973:182).

Delivered in PMRI National training for Junior high school teacher in Yogyakarta (2010), the aims of fraction learning in Junior High School can be said as follows:

1. Solving contextual problem and finding fraction concept from contextual problem that solved.
2. Understanding fraction concept, explaining the intertwining between concept and implementing fraction concept, flexible, accurately, efficiently, and correctly in problem solving.
3. Using reasoning in the pattern and property, doing manipulation and making generalization about fraction.
4. Communicating the concept and the use of fraction
5. Having appreciated attitude of the use of fraction in daily life.

However, fraction concept is not a simple concept. The uniqueness of fraction, it is different with natural number and integer, some times make it difficult to understood by student (Pitkethley & Hunting, 1996), and make it difficult to introduced to student (Clarke, et al, 2007) in Wahyu (2010). For example:

$$1\frac{1}{2} \div \frac{1}{2} = \frac{3}{2} \div \frac{1}{2}$$

$$1\frac{1}{2} \div \frac{1}{2} = \frac{3}{2} \times \frac{2}{1}$$

$$1\frac{1}{2} \div \frac{1}{2} = \frac{6}{2} = 3$$

Based on procedure above, appearing questions that need to contemplate such as (1) is it possible student that not yet study about division fraction procedure be able to solve the problem?, (2) does student understand the division of fraction procedure?, (3) what is the problem and the solution meaningful for student?. The questions need to think well, because delivery the procedure above can make student find difficulties in understanding fraction concept.

As an example, Pearn and Stephens (2004) in Wahyu (2010) do a research and find that student still often use the thinking way of integer while solving problem that related with arranging fraction. Student often look the difference between numerator and denominator to determine which fraction is bigger or smaller. Such as: when student is asked to compare fraction $\frac{2}{3}$ and $\frac{3}{5}$. Student says $\frac{3}{5}$ is bigger than $\frac{2}{3}$ because the difference between numerator and denominator in $\frac{3}{5}$ more than in fraction $\frac{2}{3}$. Therefore, it is needed the correct teaching to give student meaningful learning and student feel happy during learning process. So that, student can understand the matter well and give contribution in learning process.

One of learning approach that engages student's contribution, the use of life context and interactivity is RME (Realistic Mathematics Education). RME comes from Netherland that developed by Freudenthal (1973, 1991). He has a certain view that mathematic in human life activity. While Verschaffel and Corte (1996) in Turmudi (2009 : 9) give a term to it as " mathematics as human sense-making and problem solving activity". So, The RME theory focuses on guided reinvention through mathematizing and takes into account students' informal solution strategies and interpretations through experientially real context problems. The heart of this reinvention process involves mathematizing activities in problem situations that are experientially real to students. It is important to note that reinvention is a collective, as well as individual activity, in which whole-class discussions centering on conjecture, explanation, and justification play a crucial role (Treffers, 1991; Gravemeijer, 1994, 1999 in Department of Mathematic Educations' Ewha Womans University).

RME (Realistic Mathematics Education) gives meaning that mathematics education process is bundle process about *what is* mathematic, *how does student learn* mathematic, and *how mathematics must be taught*. So, hoped by RME students can relate what has in his thinking structure that shaped mathematic concept, with problem that he is facing. So that, mathematics learning does not become remembering process again, but become meaningful learning and reinvention character.

In a research about professional development, teachers that given assignment to compare realistic approach with nonrealistic that generally used now, had a nation that in realistic approach students appear more dominant and more effective than daily learning that have done by teacher. Students in this new paradigm actively build understanding and their mathematics knowledge by interacting between students (Turmudi, 2009 : 118). The thing give evidence that learning with Realistic Mathematics Education make students become more interesting and more active in mathematic learning. Thereby, more often students active in learning process then more often too students construct his own knowledge to solve problem. Its mean that students will try to understand and use his logic to solve problem by knowledge that students have until produce mathematic theory. As simple example, from the previous problem that has given $1\frac{1}{2} \div \frac{1}{2} = \frac{3}{2} \times \frac{2}{1} = \frac{6}{2} = 3$ if teacher gives mathematics knowledge early like this, student will be confused why division operation can be multiplication operation, and why the result the greater becomes.

But, by realistic mathematics approach student is given contextual problem that guided student to reinvention the concept why division operation of fraction can be multiplication operation. Such as give the problem as follows:

“Mother buys cooking oil $1\frac{1}{2}$ liters. Because she wants to give some her cooking oil to neighborhood, then mother infuses the oil to small bottle size $\frac{1}{2}$ liters. How many bottles that can receive the oil?”

Form the contextual problem above, can described that student can imagine the problem and try to use student’s thinking logic or reasoning in solving the problem. Because, from the infuses oil process to bottles, student is easier to understand why the result is 3. Student can understand that $1\frac{1}{2}$ and $\frac{1}{2}$ have different unit with 3. That is why the use of context need in learning process. From the example above, it can conclude that Realistic Mathematics Education (RME) invites students to develop step-by-step tool and mathematic comprehension to more formal level.

Based on description of the background, then writer interest to do a research with title “**Improvement of Student Mathematical Reasoning Ability in VII Grade SMP Negeri 1 Medan by Applying Realistic Mathematics Education (RME) on The Subject of Fraction Academic Year 2012/2013**”.

1.2 Problem Identification

From the background description is obtained problem identification in this study are as follow:

1. Student's involvement in learning process of mathematics is still less.
2. Mathematics knowledge is not built from meaningful life context and relevant to students so that students cannot construct his informal skill to be formal skill.
3. Students reasoning ability in mathematics learning is low because it does not make to be habitual early.

1.3 Problem Restrictions

According to problem statement and research question above then researcher will instruct to the case intended. Researcher makes limitation of the study on improvement ability of students reasoning in mathematics learning by realistic approach.

1.4 Problem Formulation

Based on the background that have described above, the problem in this research is formulated as follow:

1. How to implement realistic mathematics approach so that be able to improve of students' mathematical reasoning ability?
2. How is the improvement of students' mathematical reasoning ability who studied by realistic mathematics approach?
3. How does the effectiveness of realistic mathematics approach in increasing student mathematical reasoning ability?

1.5 Research Objectives

According to research question that proposed in this study, therefore researcher is formulated the goal of this research, namely:

1. To know is there an improvement in ability of students mathematical reasoning who studied by realistic mathematics education.
2. To find out whether by following realistic mathematics learning, students become more active interacting in learning process.
3. To find out the description of student response to mathematic for students that follow realistic mathematics learning.

1.6 The Benefits of Research

The result of this research later expected to provide benefits for students and teacher.

1. For students
 - a. By existence of this research expected can help students to prefer mathematic.
 - b. It can grow up motivation and interest of students in learning mathematic.
 - c. Train and improve mathematical communication and reasoning ability of students.
 - d. Train students' proficiency to cooperation and interaction with other person.
 - e. Train students to braver to give argument in learning process.
 - f. Invite students to more dominant involve and more active in learning.

2. For teacher

As a consideration in choosing appropriate mathematics learning model to improve mathematical reasoning ability of students.

Whereas, for writer as a candidate of teacher, this research gives study and input how to learning mathematic correctly. And hoped that this research can relevant appeal study for society in the next days.