CHAPTER I
INTRODUCTION

1.1. Background

Education has a very important role to ensure the survival of the nation because it can improve and develop the quality of human resources as the future generation. Education is also the root of the nation's development, the successful of development in the field of education will affect development in other areas. In UU RI No. 20 Pasal 1 Tahun 2003 on Sistem Pendidikan Nasional has been established that:

> Pendidikan adalah usaha sadar dan terencana untuk mewujudkan suasana belajar dan proses pembelajaran agar siswa secara aktif mengembangkan potensi dirinya untuk memiliki kekuatan spiritual keagamaan, pengendalian diri, kepribadian, kecerdasan, akhlak mulia, serta keterampilan yang diperlukan dirinya, masyarakat, bangsa dan negara.

Education should be able to develop the potential of students so that the concerted may face and solve problems in their experienced life. Then education should be able to see what challenges students will be faced in the future. Therefore, nowadays development in the field of education more active conducted. School is the institution that organizes the process of teaching and learning, place to transfer knowledge and skills to students. So the school is expected to produce quality human in education that can solve every problem in daily life.

Mathematics is a study that can be basic of science and technology that is very important in every aspect of human life. Therefore, mathematics is very important to teach in every aspect of human life. But in real life, education of mathematics in Indonesia isn't good enough. From international *The Trend International Mathematics and Science Study* (TIMSS) and *Programme for International Student Assessment* (PISA) in 2011 Indonesia is in 38th with 386 score against 42 nations.

Conceptualizing skill is very important to get the point of mathematics. Understanding concept from Ruseffendi (1998, 157) is an abstract idea that make us possible to classify the object or case belong to example or doesn't belong to it.

The purpose of the mathematics courses given in schools has been describe in KTSP (BSNP, 2006: 388) is that students have the following capabilities:

(1) Pemahaman konsep matematika, menjelaskan hubungan antara consep-konsep dan aplikasi secara tepat di pemecahan masalah.
(2) Menggunakan pola dan penalaran, melakukan manipulasi matematika, menyusun bukti atau ide yang dirumuskan dan pernyataan mathematika.
(3) Menyelesaikan masalah yang termasuk kemampuan memahami masalah, membuat model matematika, memecahkan model dan menginterpretasikan solusi yang diperoleh.
(4) Mengkomunikasikan ide dengan symbol, table,diagram atau media lain yang menjelaskan isu.
(5) Memiliki respek terhadap matematika dalam kehidupan, yaitu rasa ingin tahu, perhatian, dan minat belajar matematika dan sikap ulet dan kepercayaan diri dalam memecahkan masalah.

Mathematics is the science that has the concept of hierarchically, structured, logical, and systematic concepts ranging from the simplest to the most complex concepts. In learning mathematics, students are not only required to memorize mathematical formulas, but students also need to understand the concept of a material and can apply their knowledge to solve the existing problem. So, we can conclude that conceptualizing skill is to understand concept, predict, understand something after something is learned, and is able to facilitate the meaning of the thing being learned.

According to Eggen and Kauchak (2009: 98), "The concept is an idea that refers to a group or category, in which all its members share some common characteristics ". It can be formulated into three, namely: (1) Superordinate, it's about connecting a concept with a broader concept, (2) Coordinate, it's about linking the concepts are interconnected and (3) Subordinate, it's about the relationship between two concepts that have reciprocal relationship (Eggen, *et al.*, 1993: 193). To understand a concept students need to look at various examples, so that students will gain a more correct appreciation, and can apply the concept into other situations (Ruseffendi, 1980: 135).

Concerning the grouping of the above concept "Bolton (1977) distinguishes concepts into three types: physical concepts, mathematical logic concepts, and philosophical concepts" (Hardi, 2000: 104). Physical concept is a concept that the object is mentioned directly, the concept of mathematical logic is a concept whose object is not mentioned directly, but only refers to the structure of behavior and

operation in dealing with an object, while the philosophical concept is a concept that closely relates to the quality of the object itself. Based on the experience and observations of the author on some learning activities of mathematics in school, many students who experience misconception in mathematics. This is mostly due to teachers' mistakes in the delivery of materials, or teachers who present the material does not understand the concept presented. The definition of misconception here is the student's mistake in understanding a concept that occurs repeatedly. Inside solve a problem, the student should first have some abilities such as the ability to understand the concept, understand the problem, able to associate the concept with one another, able to apply the concept to new situations, and able to evaluate the tasks performed.

According to Yuliani (2003: 23), "to understand the concept in mathematics, students should learn actively by doing experiments to find the concept. The ability of students to differentiate, categorize, and name something will cause the emergence of a stimulus in understanding a concept". Based on the above description, then the concept is meant an abstract idea that will be used to group the objects into the sample and not an example of those objects. Thus, the students must understand very well about the concepts they are learning today, so that future learning goes well, because each learned concepts are interrelated. In addition, when students learn concepts, students will learn to associate one idea with another idea, so that here happens the process of thinking students analytically.

In mathematics learning there are various concepts that must be understood by students, and students are required to be able to master the concepts that exist as possible. This is in keeping with Bruner's opinion that "learning mathematics is to learn about the concepts and structures of mathematics contained in the material being studied, and to seek out the relationships between concepts and mathematical structures" (Herman 1990: 48). Teachers can know the ability and understanding of students to a given concept, especially in math lessons by looking at what the students do themselves, for example students can mention the characteristics of a concept, distinguish the example and not the example, and even can solve the problem. Students are said to understand a concept in mathematics, or understand the concepts given in mathematics learning, if they are able to represent

mathematical situations in different ways and knowing how different representation can be useful for different purposes. In addition, students can also find and explain the connection of every concept at all.

Skills may refer to the specific action displayed or on the nature in which the skill is exercised. Many activities are regarded as a skill, or consist of some skills and degree of mastery achieved by a person describing his or her skill level. This can happen because of a commonly accepted practice of stating that one or more refined patterns or behaviors can be called skills, such as writing, playing a guitar or piano, tuning a machine, walking, running, jumping, and so on. If this is used, then the word 'skill' is meant as a noun. On the other hand, skill can also be used as an adjective, even if it is used, the word has changed its structure to just being skilled. This word is used to indicate a level of success in performing a task.

Taking into account the conditions of the two things described above, the term 'skill' must be defined in two ways. *First*, by referring to it as a noun, which refers to a particular activity which corresponds to a set of motions that must be fulfilled to be called a skill. *Second*, by considering it as an adjective. What people have done so far in relation to the term new skills is limited to the definition of definitions in the latter context. Schmidt (1991) tries to illustrate the definition of such skills by borrowing the definitions created by E.R. Guthrie, who says that: "Skill is the ability to make the final result with maximum certainty and minimum energy and time expenditure." While Singer (1980) states that "skills are consistent degrees of success in achieving an objective efficiently and effectively."

Thus, the skill describes a person's ability to do something. Skeptical conceptualization means the ability of students to understand a particular concept in the activity or learning process and can be applied in real life.

Conceptual understanding refers to an integrated and functional grasp of mathematical ideas (Kilpatrick, et al. 2001: 139). Students with conceptual understanding know more than isolated facts and methods. They understand why a mathematical idea is important and the kinds of contexts in which is it useful. They have organized their knowledge into a coherent whole, which enables them to learn new ideas by connecting those ideas to what they already know. Conceptual understanding also supports retention. Because facts and methods learned with

understanding are connected, they are easier to remember and use, and they can be reconstructed when forgotten. If students understand a method, they are unlikely to remember it incorrectly. They monitor what they remember and try to figure out whether it makes sense. They may attempt to explain the method to themselves and correct it if necessary. Although teachers often look for evidence of conceptual understanding in students' ability to verbalize connections among concepts and representations, conceptual understanding need not be explicit. Students often understand before they can verbalize that understanding.

Based on the description, in this research conceptualizing ability will be measured through students' ability to complete a problem by using understanding concept by Kilpatrick, Swafford, & Findel (2001: 140) as the significant indicator of conceptual understanding is: (1) being able to represent mathematical situations in different ways and (2) knowing how different representations can be useful for different purposes.

Based on the observation that has been made to the students of class XII IPA 2 in SMA Negeri 1 Tebing Tinggi, showed that students in mathematical conceptualizing ability are still low and the majority of teachers teach by lecture method and writing notes on the board. Diagnostic tests conducted by the researcher by giving the problem to see students' mathematical conceptual understanding ability. In this research, the researcher chose one topic about of Algebra. This difficulty can be found from the mistakes made by students as follows:

Problem

1. Ada tiga tumpukan batu, yang pertama memiliki 5 kurang dari yang ketiga, dan yang kedua memiliki 15 lebih dari yang ketiga. Ada 31 banyak batu. Tentukan persamaan matematika dan gambarkan tumpukan batu pertama, kedua, dan ketiga dari masalah di atas!
2. Jumlah dua angka berurutan selalu ganjil. Bisakah kamu tunjukkan mengapa, menggunakan aljabar?

From the answers that have been given by students, obtained:

1. Students isn't able to represent mathematical situation from the problem.

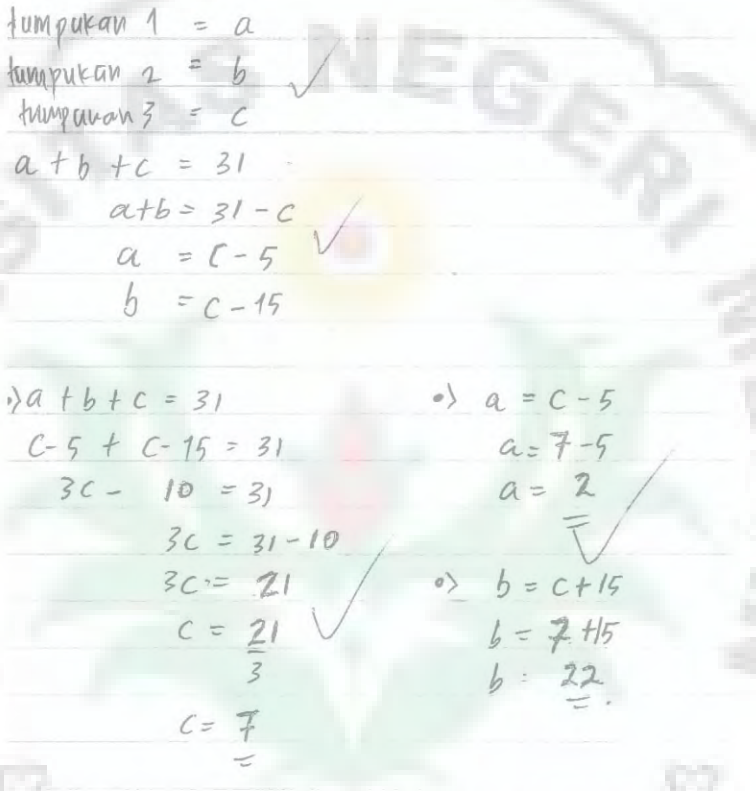

Figure 1.1. Student's answer about to represent mathematical situation in different ways

From Figure 1.1 shows the students just can represent one way about mathematical equation. They didn't able to represent another way about drawing every pile of stone.

2. Students isn't able to represent for different purposes.

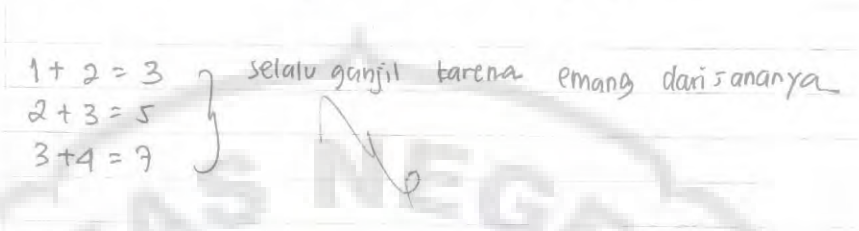

Figure 1.2. Student's answer about how different representation can be useful for different purposes

From Figure 1.2 shows the students didn't able to get the purpose how to get the odd number from adding two sequentially number. They just present their presentation without purposes.

From the data in appendix 20, the average of contextual teaching and learning's student in XII IPA 2 is 1.87 with low category. Students reach the learning mastery individually if had reached the minimal mastery criteria 2.66/B- in moderate category (Permendikbut RI No. 81A Tahun 2013). The average 1.87 is still lower than 2.66, it means that learning mastery individually in conceptualizing skill of students class XII IPA 2 are low and need to be increased.

Compared with score of student's daily test at first semester in grade XII, the average of learning mastery individually of student in XII IPA 2 is 2.48 with low category. Base on this score that has been gotten continuously, 2.48 is lower than 2.66, it means classroom action research must be applied.

To overcome the low math scores, educator is trying to hold the reparation and improvement in all aspect related to mathematics education. Many teachers have difficulty in teaching students. This difficulty may occur due to paradigm that the final answer is the only goals of solving the problem that causes students often use the wrong technique in answering the problem. Actually, we need to realize that understanding concept of problem is much more important and fundamental. When a final answer is preferred, students may only learn to solve a particular problem, but if the process is emphasized students will learn how to solve the problem more complex.

But in fact, the quality of mathematics education still apprehensive seen understanding concept students' ability is low. Learning mathematics is still considered as difficult as learning to use the symbols is understood by memorizing

stated mathematical formulas so that students are learning the most disliked and abstract. Students tend to memorize the concepts only and do not want to find their own the idea. Only teachers always have active role in teaching and learning process so the students' ability to understand concept become less.

The student's difficulty which was found is in the problem of understanding, drawing diagrams, reading the charts correctly, conceptual formal mathematical understanding, and mathematical problem solving (Eisenberg, 1994; Arcavi, 2003; Stylianou & Silver, 2004)

Sabandar (2005) said that an enhancement in the ability of mathematical representations is done through the process of discovery by using the concept of horizontal and vertical mathematics. The horizontal mathematics concept is the identification and visualization problems' form through sketches or drawings that have been known to students. The vertical mathematics concept is the representation of the relation form and adjustment of a mathematical model about the use of different models and generalization.

There are several theories reference contextual learning mathematics. Basically the contextual learning of mathematics refers to constructivism. Slavin (1997: 269) states that learning is the students themselves according constructivism must actively find and transfer or build knowledge that will be hers. Students in the learning process to check and adjust the new knowledge learned with the knowledge or frame of mind they already have. The role of teachers in teaching is more as a mediator and facilitator.

Suparno (2001: 10-11) states in essence, the teacher acts as a facilitator who is responsible for providing learning experiences that enable students to take responsibility in the learning activities. Teacher or provide activities that stimulate student curiosity in helping students to express their ideas and communicate scientific ideas; provide a means of stimulating students to think productively, encouraging students to monitor, evaluate and demonstrate student thinking that are relevant or irrelevant with which to face the new problem related to students are learning.

Mathematics learning is contextual also refers to the theory of meaningful learning belonging to the flow of cognitive learning psychology. Ausubel (in Dahar,

1989) states that learning can be categorized in two dimensions related to how knowledge (information, subject matter) is presented to students by linking knowledge to students' cognitive structures that already exist or the student. According to Ausubel meaningful learning is a process of linking new knowledge relevant to the knowledge that was contained in the student's cognitive structure.

Suryanto (2001: 2) states that according to Freudenthal mathematics learning should be linked to the reality of life, close to nature and relevant to the student's mind with the community in order to have human value.

Johnson (2007) reveals the eight components in contextual learning, namely; (1) Make meaningful linkages; (2) Independent Learning; (3) Doing meaningful work; (4) In collaboration; (5) Thinking critically and creatively; (6) Helping people to grow and develop; (7) Achieving a high standard; (8) Using authentic assessment.

As expressed by Sanjaya (2016: 260) that the Contextual Teaching and Learning (CTL) model has several advantages, namely:

(1) Belajar bukan menghafal, tetapi proses merekonstruksi pengetahuan sesuai dengan pengalaman yang dimiliki.
(2) Belajar bukan sekadar mengumpulkan fakta yang lepas-lepas tetapi merupakan semua organisasi yang dialami.
(3) Belajar adalah proses pemecahan masalah, sebab dengan pemecahan masalah anak akan berkembang secara utuh secara intelektual, mental, dan emosional.
(4) Belajar adalah proses pengalaman sendiri yang berkembang secara bertahap dari sederhana menuju kompleks.
(5) Belajar pada hakekatnya adalah menangkap pengetahuan dari kenyataan (real world learning).

As the several advantages of CTL, the first and fourth advantages are very useful to achieve the indicators of conceptual understanding. The first advantage will guide the students to represent mathematical situation in different ways of own learning experiences and the fourth advantage will guide the student to know the purposes from every representations as the complex learning experiences.

Based on description above, the researcher is interested in examining this issue in an action of research entitled "**The Implementation of Contextual Teaching and Learning to Improve Mathematical Conceptualizing Skill on Grade XII SMAN 1 Tebing Tinggi**".

1.2. Problem Identifications

In order the purpose of this study is clear and focus it is necessary to identify the problem. Based on the background, some problem can be identified as follows:

1. Students' mathematical conceptualizing ability is still low.
2. Students find many difficulties to represent mathematical concept to solve the problem.
3. Contextual Teaching and Learning model is rare to be applied in learning mathematics process at SMA Negeri 1 Tebing Tinggi.

1.3. Problem Limitations

Because the extent of the problem and the limited ability and time so the problem limitation of the research is:

1. The students' mathematical conceptualizing ability is still low which is shown by students feel difficult to represent mathematical concept to solve the problem.
2. The using of Contextual Teaching and Learning model isn't applied in learning mathematics process at SMA Negeri 1 Tebing Tinggi.

1.4. Problem Formulations

Based on the background, the problem of this research can be formulated as follows:

1. How Contextual Teaching and Learning model can improve students' mathematical conceptualizing ability of SMA Negeri 1 Tebing Tinggi?
2. How the effectiveness of Contextual Teaching and Learning model to improve students' mathematical conceptualizing ability of SMA Negeri 1 Tebing Tinggi?

1.5. Research Objectives

According of problem formulation, the objective of research will be achieved are:

1. To know the process Contextual Teaching and Learning model can improve students' mathematical conceptualizing ability of SMA Negeri 1 Tebing Tinggi.
2. To know the effectiveness of Contextual Teaching and Learning to improve students' mathematical conceptualizing ability of SMA Negeri 1 Tebing Tinggi.

1.6. Research Benefits

After doing this research study is expected to provide benefits for all people, including:

1. For researchers, to increase knowledge for themselves, especially for the development of students before entering the actual learning process.
2. For the students, through Contextual Teaching and Learning is expected to build positive and pleasure learning attitude in solve mathematical problem.
3. For the teacher, to consider a better method of learning in mathematics
4. The result of this study can provide a good contribution to the school in improvement of mathematics teaching at SMA Negeri 1 Tebing Tinggi.

1.7. Operational Definition

This research, entitled is improving Student's Mathematics Conceptualizing Ability Using Contextual Teaching and Learning model at SMA Negeri 1 Tebing Tinggi. Terms that require some explanations are as follows:

1. Mathematical conceptualizing ability is students' abilities in represent mathematical situations in different ways and knowing how different representation can be useful for different purposes (Kilpatrick, 2001: 140).
2. Contextual Teaching and Learning model is one of learning model that using Piaget, Constuctivisme, and Bruner's Theory which guide students easily to understand concept (Saraningsih, 2014: 158).
3. CTL as a learning has seven the principle that underlies the process of implementing learning, namely: constructivism, inquiry, ask and answer, community learing, modeling, reflection, and assessment (Sanjaya, 2012: 262).