**CHAPTER I**

**INTRODUCTION**

1. **Background**

Learning is a relatively permanent change in behavior or behavior potentiality that results from experience and cannot be attributed to temporary body states such as those induced by illness, fatigue or drugs Hergehahn and Matthew, 2003: 8). Additionally, Sudjana said that learning is the process of seeing, observing and understanding something (Rusman, 2012 : 1).

Learning is to guide the student to use education principle and learning theory as the main determinant for educational success. Learning is two-way communication process, taught by teachers as educators, while the study is done by students or pupils. (Syaiful Sagala , 2008 : 7). The learning process is internal from within the individual, whereas external learning process is deliberately planned to achieve a particular goal.

Mathematics is one of universal knowledge, which means that mathematics can act as the fundamental of all knowledge. All knowledge need mathematics to help them on their development process, then it can be seen that mathematics plays an important role in the development of science and technology.

Mathematics in school is very important to improve the quality of human resources. To achieve these objectives, the learning process needs to consider the six principles for school mathematics by NCTM (2000): (1) *Equality,* Excellence in mathematics education requires equity high expectations and strong support for all students. (2) *Curriculum*. A Curriculum is more than a collection activities; it must coherent, focused on important mathematics, and well articulated across the grades. (3) *Teaching*. Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well. (4) *Learning.* Student must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge. (5) *Assessment.* Assessment should support the learning of important mathematics and furnish useful information to both teachers and students. (6) *Technology.* Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students’ learning.

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Mathematics is intended for learners to have these following capabilities (BSNP, 2006): (1) Understanding mathematical concept, explain the relation between the concept and apply concepts or algorithm flexibly, accuracy, efficiently, and appropriately in solving problems. (2) Using the reasoning ability in patterns and characteristics, mathematical manipulation for making generalizations, compiling evidence, or explaining mathematical ideas and statements. (3) Solving problems that include the ability to understand the problem, designing a mathematical model, solving the model and interpreting the obtained solution. (4) Communicating ideas with symbols, tables, diagrams, or other media to clarify the situation or problem. (5) Having respect for the useful of mathematics in life, curiosity, attention, and interest in studying mathematics, as well as a tenacious attitude and confidence in problem solving.

Related to mathematics course, Nikson in Wira (2010) describe that learning mathematics is an effort to help students construct (build) mathematics concepts or principles with their own capability by internalization process, so that the concept or principle rebuild. Thus, learning can be defined as an effort to build students understanding. Learning here is more emphasis on how the teacher can support or facilitate their students to study.

Mathematics learning needs to refer to mathematics proficiency or expertness which is expected to achieve in studying mathematics. It always demonstrates an understanding of the mathematical concepts learned, be able to explain the relation between concepts and apply the concept on problem solving in daily life appropriately.

Mathematics learning and mastery learning mathematics problems are two very important things. Mastery learning is often used as an indicator to indicate a person's success in learning process. However, mastery learning itself depends on various aspects such as teaching and learning process, the situation and the availability of supporting facilities. In addition, according to the NCTM (2000) students must have five math skills beside mastery of the material those are reasoning, connections, communication, problem solving, and the ability of mathematical representations. These capabilities are required in learning mathematics concepts or in the process of solving non-routine problems.

However, in reality we see that the mathematical ability of Indonesian student’s was very low. It is obvious from the results of a survey conducted by the *Trends in International Mathematics and Sciences of Education Study (TIMSS)* in 2007, coordinated by the *International for the Evaluation of education Achievement (IEA)*; generally the results put Indonesia on the 36th position from 49 countries surveyed in the field of mathematics.

In mathematics learning that is usually applied in school, students just memorize concepts or formulas without seeing the problem that are related to the concepts. Beside that, abstract structures could be one factor that contributing the mathematical concepts difficult to understand. This condition caused the lowness of students’ mathematical conceptual understanding.

Many studies have shown that students’ mathematical ability is quite low. In detail Wahyudin found five weaknesses in students includeing: lack of prerequisite knowledge, lack of the ability to understand and identify the basic concepts of mathematics (axioms, definitions, rules, theorems) relating to the subject being discussed, lack of the ability and accuracy in review or identify a problem or mathematical problems that related to a certain subject, lack of the ability recheck the answer obtained (if the answer is possible or not), lack of logical reasoning abilities in solving problems mathematics (Tedi Ruhyadi, 2012 : 6)

Besides conceptual understanding, in mathematics learning is also necessary to have problem solving skill. Problem solving is not just the skills to be taught and used in mathematics but also skills that will be used on daily problems or situations in decision-making; thereby it will help people to solve their life problem. Problem solving provides the opportunity for students to make connections with their prior knowledge and make decisions about representation, computational tools and strategies that needed to solve the problem. For being a skilled problem solver in mathematics, students must understand the concepts and to be able to see mathematics as something related to each other as a whole

Related to students’ mathematics problem solving ability case, there was a triennial survey held by *Programme for International Student Assessment* (PISA) 2006 which placed Indonesia on 52th position from 57 countries in mathematics field. It is assessed in PISA are students' ability in solving (problem solving), formulate the reasoning (reasoning) and communicate its ideas to others (communication). These results show that besides conceptual understanding, Indonesian students’ were still lacking in terms of problem solving.

Improved students’ conceptual understanding can be done by making some changes to the learning systems. Teacher must choose the right learning system to increase the student’s conceptual understanding ability, such as direct instruction by using recitation.

According to Kardi (Trianto, 2009: 43), direct instruction model uses some methods such as expository, demonstration, training or practice. This model is considered effective to help students learn about the basic knowledge and skills. Meanwhile, recitation method is a method which gives tasks to students to be done in their house or in the school and have to be responsible to the teacher.

Besides that, Biggs and Collis (Alagmulai, 2006) conducted a study about the structure of learning outcomes by using super item test. On their result describe that every level or cognitive level has the same structure of response and increase from the simple to abstract. This structure is known as SOLO taxonomy (*Structure of the Observed Learning Outcomes).* According to Biggs and Collis (Alagmulai, 2006) based on the quality of the model response to children, SOLO stage children are classified in five stages: pre-structural, uni-structural, multi-structural, relational, and extended abstract.

Study about SOLO taxonomy has also been carried out by Sumarno (Teti Ruhyadi, 2012: 8). His research result increases the confident that learning mathematics, explanation about mathematics concept should not be directly on the concept or complex process, but begin from concept and simple process.

Superitem consists of a stem that is followed by some questions or items which increase its complexity. Every item represents the level of SOLO taxonomy. At the first level required the use of a single piece of information. Level two required two or more pieces of information from the stem. At the third level should be able to integrate two or more information that is not directly related to the stem. And on the fourth level students can define hypotheses derived from the stem.

The characteristics of superitem problems contain concepts and process with higher level of cognitive gives opportunities for students to develop their knowledge to understand the relation between concepts. Moreover, superitem test is expected more challenging and encouraging students involvement in learning process. Beside that, the teachers can diagnose during learning process, so that the progress of students achievement can be monitored earlier.

In addition, we also recognize the existence of another taxonomy that has been popular in education. Taxonomy introduced by Benjamin S. The Bloom taxonomy. It has been familiar used in making learning outcomes test. This taxonomy includes educational and learning purposes.

Bloom taxonomy grouped cognitive objective into six categories. The six categories includes simple intellectual competence skill, that are the level of knowledge, understanding, application, analysis, synthesis up to the most complex level that is evaluation. Thus, cognitive goal is oriented to “thinking” ability includes simple intelectual ability namely “recall” until the ability to solve a problem (problem solving) that requires students to connect and combine ideas, methods, and procedures that were previously studied to solve the problem. Cognitive objectives always used in learning process.

Based on views about the benefits of recitation method by utilizing task development using SOLO taxonomy and bloom taxonomy, then the researcher doing research with title “**Trigonometric Conceptual Understanding and Problem Solving Ability Comparison Through Direct Instruction between Students Given Task based on SOLO Taxonomy and Students Given Task based on Bloom Taxonomy”**

In this case, the researcher chooses mathematical material “Trigonometry” as object of study for conceptual understanding and problem solving terms. Considering that in learning trigonometry we often look at the fact that most of students rely on memorizing formulas of trigonometry rather than understand the actual concepts.

1. **Problem Statement**

The lowness of mathematics learning outcome is one of problem that needs to be solved soon. Supposed that one reason is the lack of students' understanding of mathematical concepts. The fact shows us that the student is relying to their memorizing ability than understanding the concept. Besides that, the lowness of conceptual understanding ability is also caused to problem solving ability.

Related to this problem, this study will compare the mathematics conceptual understanding and problem solving ability students who taught by direct instruction by giving task based on SOLO taxonomy and task based on Bloom taxonomy. Therefore, we can see the difference of them.

It will be one of the considerations in selecting the type of learning that will be used in order to improve students’ conceptual understanding and problem solving, that can also help to improve students’ learning outcomes.

1. **Research Questions**

Based on the problem statement above, the research question are:

1. What is the level of improvement of students’ trigonometric conceptual understanding ability who are taught by giving task method based on SOLO taxonomy?
2. What is the level of improvement of students’ trigonometric conceptual understanding ability who are taught by giving task method based on Bloom taxonomy?
3. What is the level of improvement of students’ trigonometric problem solving ability who are taught by giving task method based on SOLO taxonomy?
4. What is the level of improvement of students’ trigonometric problem solving ability who are taught by giving task method based on Bloom taxonomy?
5. Is there any difference between the improvement of trigonometric conceptual understanding ability students who are taught by giving task method based on SOLO taxonomy and students who are taught by giving task method based on Bloom taxonomy?
6. Is there any difference between the improvement of trigonometric problem solving ability students who are taught by giving task method based on SOLO taxonomy and students who are taught by giving task method based on Bloom taxonomy?
7. **The Objective of Research**

Based on the research questions above, then the objectives of this research are:

1. To find out the improvement of trigonometric conceptual understanding ability of students who are taught by giving task method based on SOLO taxonomy.
2. To find out the improvement of trigonometric conceptual understanding ability of students who are taught by giving task method based on Bloom taxonomy.
3. To find out the improvement of trigonometric problem solving ability of students who are taugh by giving task method based on SOLO taxonomy.
4. To find out the improvement of trigonometric problem solving ability of students who are taugh by giving task method based on Bloom taxonomy.
5. To find out whether there is a difference between the improvement of trigonometric conceptual understanding ability of students who are taught by giving task method based on SOLO taxonomy and students who are taught by giving task method based on Bloom taxonomy
6. To find out whether there is a difference between the improvement of trigonometric problem solving ability of students who are taught by giving task method based on SOLO taxonomy and students who are taught by giving task method based on Bloom taxonomy
7. **Benefits of Research**
8. Teoritical benefits

To give description about the difference between the trigonometric conceptual understanding and problem solving ability of students who are taught by giving task method based on SOLO taxonomy and students who are taught by giving task method based on Bloom taxonomy

1. Practical benefits
2. Students

Give new experience which can increase their conceptual understanding and problem solving ability in mathematics learning..

1. Teachers

As one of consideration to select learning model which can improve students’ conceptual understanding and problem solving ability.

1. **Operational Definition**

To avoid some errors that may occur in the use of terms in this study it should be given the following explanations:

1. Conceptual understanding is an ability to recognize the facts, concepts, principles and skills, to classify objects, to give examples and non-examples of the concept, to use, to utilize and to choose specific procedures and to apply them in problem solving.
2. Problem solving is an ability to identify the element that are known, asked, to arrange mathematical model, to apply the strategy to solve some problem, to explain or to interpret the results based on origin problem, and to use mathematics purposely.
3. Direct isntruction is one of learning models of which the implementation of learning centered on teacher, teacher is the main source and give the main information, emphasis on knowledge rather than on the admissions process and the search process of knowledge construction.
4. Giving task method (recitation) is a method which gives tasks to students to be done in their house or in the school of which students have to be responsible to the teacher.
5. SOLO taxonomy is taxonomy of learning objective that divides the cognitive level into 5 levels namely pre-structural, uni-structural, multistructural, relational and abstract.
6. Bloom taxonomy is taxonomy that divides cognitive domain into six level namely low-level thinking process consists of remembering, understanding, applying; while high-level thinking process consists of analysing, evaluating and creating.
7. Superitem test is a kind of test that is developed by using SOLO taxonomy in which every item in test represent certain level.