

CHAPTER 1

INTRODUCTION

1.1 Background

Mathematics is the oldest science and basic science has an important role in science and technology. The statement is supported by the statement Cockroft (in Abdurrahman, 2009:253) argues that mathematics should be taught to students because:

1. Mathematics always be used in all aspects of life.
2. All area studies require to math skills appropriate.
3. Can be strong, short and clear in communication.
4. Can be used for present information in various way.
5. Increase logical thinking, accuracy and awareness spatial.
6. Provide satisfaction against to solve challenging problems.

Mathematics education is one of study taught at every level of education. Mathematics education has a very dominant role in educating students for developing critical thinking skills, analytical and logical. One of the problems that occur in the world of education in Indonesia is the low quality of mathematics education, both in terms of process and learning outcomes, thus causing low Indonesian student mathematics achievement.

The mathematics problem is a matter of mathematics or mathematical statement in which there is no procedure or algorithm that can be directly used or used by students to solve the problems, and the statement must be solved by the students. Teachers are required to encourage students to actively learn and can improve the ability of solving mathematical problems which are important factors in mathematics. Slameto (2010: 94) argues that:

"In the teaching and learning interaction, teachers have a lot to give freedom to the students, to be able to investigate itself, observing his own, self-study, finding solutions to their own problems. This will cause a sense of great responsibility towards what will be done, and confidence to yourself, so that students do not always cleave to others".

The fact that mathematics education in Indonesia is still disappointing. The low outcomes is a serious problem that must be solved, because the success of the learning process is not only dependent on the teacher but the students also played a role. Through learning model, teachers can help students get information, ideas, skills, ways of thinking and expressing ideas. Therefore, active learning is required of students so that they can improve their learning performance as proposed by Noor (<http://pages-yourfavotite.com/ppsupi/abstrakmat2005.html>) that:

“Active learning is required of the students, so that they can improve their learning performance. Therefore, teachers are required to encourage students to actively learn and can improve reasoning skills in mathematics which is an important factor in mathematic”.

The learning process at schools, many obstacles faced by the students, one of these obstacles is the lack of student interest in receiving the teacher's lessons, especially in mathematics is one of study that less diserable for students and considered is the most difficult lessons since first . As pointed out by Rida (<http://www.duniaguru.com>) said that: "The fact show the students relatively low in mathematic so it's very rare to find our students understand the concept and application of mathematics well". Similar to Pranoto (<http://www.sigmetris.com>), "With the growing of perception about irrelevance or not beneficial mathematics, their motivation to learn mathematics will be down, or even disappear". This is in line with the results of the interview on January 6, 2014 which is disclosed by math teacher at SMAN 1 Perbaungan, Mr. Edi Lokot that: "The problems often faced by teachers when teaching mathematics due to the lack of interesting with math and understanding with the basics of mathematic as soon as assume mathematical considered a difficult subject and avoid, it makes students being confused and bored when study ongoing process". And because in SMAN 1 Perbaungan still using learning teacher oriented model.

Trigonometry is a math subject in grade x for this second semester. Trigonometry has a very close relationship in our lives, both directly and indirectly. Originally, trigonometry comes as solution of solving of simple

planes, with the growing of time, trigonometry is often used in world of applied sciences, the development of other sciences, and the development of mathematics itself. On this topic there are many students who have difficulty in solving a given problem, it's not surprising because there are too many formulas to remember and need more understanding. To improve their learning outcomes through the application of knowledge, learn to solve problems, find something for themselves and discuss each other with their friends, the way is to choose an appropriate learning model with the cooperative learning model. Correspondingly Nurgayah (2011: 66) also states that:

"In the model of cooperative learning is done by developing interaction and work together in a structural team work, educate among each students to avoid offense, misunderstanding in learning in order to reach the learning objective. There are at least three important learning objectives by implementing cooperative learning model, which is the result of academic learning, acceptance of diversity or individual differences, and the development of social skills or cooperation and collaboration skills".

In the implementation of cooperative learning can change the role of teachers from teacher-centered role to a role managing a small group activity. Thus the role of the teacher during monotonous will be reduced and students will be trained to solve problems, even problems that are considered intractable. There were 4 of cooperative learning approach according to Trianto (2011: 67), "That Student Teams-Achievement Division (STAD), JIGSAW, Investigation Group (Teams Games Tournaments or TGT), and the Structural approaches include Think - Pair-Share (TPS) and Numbered Head Together (NHT)".

Because teachers' mastery of the learning model is still not optimal, the researcher tried to introduce cooperative learning models for math teachers in SMAN 1 Perbaungan. One of the cooperative learning model to improve learning outcomes is cooperative learning model type Think-Pair-Share (TPS). The reason the researchers chose this learning model because TPS is a type of cooperative learning that is designed to influence the pattern of interaction that occurs between students in learning activities. In this case the student is expected to work in small groups to help each other and be identified with a pattern of cooperation

rather than individuals. The advantages of TPS models are shaping individual and a pair group responsibility, because in this model there are individual tasks and task groups. So also with cooperative learning model Student Teams-Achievement Division (STAD) is the simplest cooperative learning, with 4-5 people heterogeneously discussions. STAD cooperative learning created between student interaction with the students and also between students and teachers to create a learning community. Students not only learn from teachers but also from fellow students. In STAD cooperative learning requires active student participation in group discussions. According to Istarani (2011: 68-69), think-pair-share has strength:

1. Be able to improve students' reasoning, critical power of students, the students' imagination and power of analysis to a problem;
2. Promote cooperation among the students as they work in groups;
3. Improve the ability of students to understand and appreciate other opinions;
4. Improve students' ability to express opinions as implementation of his/her knowledge;
5. Teacher is more likely to increase students' knowledge when they finished with the discussion.

And there are some of the strength of cooperative learning model STAD (Student Teams-Achievement Division), according Nurgayah (2011: 86-88) are:

- a. In STAD cooperative learning model, learners are not overly relied on teachers, but also increased confidence in the ability to think independently, finding information from a variety of sources as well as learning from other learners.
- b. STAD cooperative learning model develops the ability to express an idea or ideas verbally and compare with other people's ideas.
- c. STAD cooperative learning model can help learners to appreciate others and aware to the limitations as well as receiving all the difference.
- d. STAD cooperative learning model can help learners to take more responsibility in learning.
- e. STAD cooperative learning model improves academic achievement and social, including developing a sense of self-esteem.

Polya defined problem solving as finding “a way where no way is known, off-hand... out of a difficulty...around an obstacle”. Polya stated that to know mathematics is to solve problems. The difference between nonroutine and routine problems seems to be a key element in how problem solving is currently being viewed among mathematics educators. The primary purpose of mathematical problem-solving instruction is not to equip students with a collection of skills and processes, but rather to enable them to think for themselves. The value of skills and process instruction should be judged by the extent to which the skills and processes actually enhance flexible, independent thinking. With above statement parallel according to Carmen (<http://www.lamath.org/journal/Vol11/What IS PSAbility.pdf>) conducted a critical analysis of the research on problem solving in secondary school mathematics between the years of 1925-1975: “Out of twelve conclusions, one stated the following. Characteristics of an effective problem solver can be identified. An effective problem solver: tends to use a wide range of heuristic strategies; seems to follow some plan of attack when solving a problem and exhibits trial-and-error ability; has good arithmetic skills; has confidence in own mathematics ability; tends to check answers for reasonableness and is able to estimate an answer; and usually obtains an understanding of a problem before trying to solve it. Some of the mathematicians attempted to make problem solving into a more detailed process than the mathematics educators. For example, one mathematician defined problem solving to be the process of evaluating possible techniques, applying techniques, reaching a solution, checking the results for accuracy, and writing out the solution in a coherent fashion”.

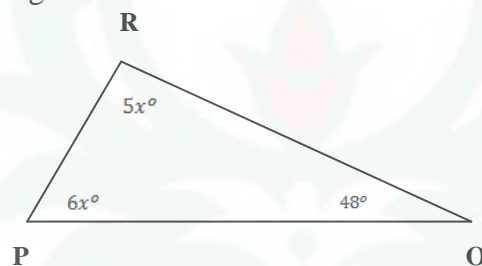
Research has also been conducted regarding what constitutes the process of problem solving ability. Polya (1945/1973) posited four problem-solving steps in *How to Solve It*: understanding the problem, devising a plan, carrying out the plan and looking back.

Researcher using this model for cooperative learning has not previously been applied by the teacher. From the result of survey that conducted by researcher (February 4, 2014) by giving the problem solving the initial capability

test to student of grade XU-1 and XU-2 of SMA Negeri 1 Perbaungan. In topic of Angle Size and Angle Triangle as a prerequisites matter of trigonometry topic.

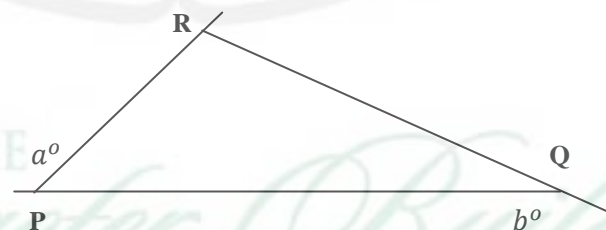
With the initial capability test item:

1. A and B angles are supplementary angles where the ratios is 4 : 5. Determine size of B angle.
 - a. What is known and asked of the above question?
 - b. How to determine size of B angle?
 - c. How to result of size of B angle?
 - d. According to Ima, the result size of B angle is $\angle B = 100^\circ$. Is it true that the results of the calculation Ima?
2. Look this figure.



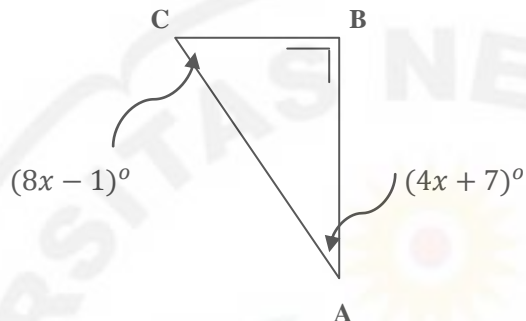
Determine size of PRQ angle.

- a. What is known and asked of the above question?
 - b. How to determine size of PRQ angle?
 - c. How to result of size of PRQ angle?
 - d. According to Sari, the result size of PRQ angle is $\angle PQR = 60^\circ$. Is it true that the results of the calculation Sari?
3. Determine size of PRQ in figure below that is stated with a in b.



- a. What is known and asked of the above question?
 - b. How to determine size of PRQ?
 - c. How to result of size of PRQ?
 - d. According to Andi, the result size of PRQ is $\angle R = a^\circ + b^\circ - 180^\circ$. Is it true that the results of the calculation Andi?

4. Calculate size of every angle in ABC triangle.



- What is known and asked of the above question?
- How to determine size of every angle in ABC triangle?
- How to result of size of every angle in ABC triangle?
- According to Tono, the result size of every angle in ABC triangle is $\angle A = 35^\circ$; $\angle B = 90^\circ$; $\angle C = 55^\circ$. Is it true that the results of the calculation Tono?

This is example from the answer one of student.

Nama : Mia
Kelas : XV-1

1. Known : Angle A and B are supplementary ; $\frac{\angle A}{\angle B} = \frac{1}{5}$ Asked : size of B angles ?

$$\angle A + \angle B = 180^\circ$$

$$\frac{\angle A}{\angle B} = \frac{1}{5} \quad \text{so, } \angle A = \frac{1}{5} \angle B$$

$$\frac{1}{5} \angle B + \angle B = 180^\circ$$

$$\frac{6}{5} \angle B = 180^\circ$$

$$\angle B = 150^\circ$$

2.

$$\angle P + \angle R + \angle O = 180^\circ$$

$$\angle P = 6x^\circ$$

$$\angle R = 5x^\circ$$

$$\angle O = 48^\circ$$

$$\text{so, } 6x^\circ + 5x^\circ + 48^\circ = 180^\circ$$

$$11x^\circ = 180^\circ + 48^\circ$$

$$11x^\circ = 228^\circ$$

$$x^\circ = 228/11$$

3.

$$\angle P + \angle R + \angle O = 180^\circ$$

$$\angle P = 180^\circ - a^\circ$$

$$\angle O = 180^\circ - b^\circ$$

$$\text{so, } (180^\circ - a^\circ) + \angle R + (180^\circ - b^\circ) = 180^\circ$$

$$\angle R = a^\circ + b^\circ - 180^\circ$$

4. Known :

Asked : size of $\angle A$, $\angle B$.

$$\angle A + \angle B + \angle C = 180^\circ \quad \rightarrow \quad (4x+7)^\circ + ($$

Figure 1.1 One Student Answer Sheets

At figure 1.1 can be seen that the students know about the problem, but do not understand the steps of problem solving, making it less obvious steps taken and no checking solution. Just added the steps of problem solving that students can answer the question with a perfect score. The initial capability test result also shown that there was not student who completed to solve problem.

From grade XU-1 with number student is 20 who took the test, the average of class score that obtained is 53.50 (score scale 0 – 100) and grade XU-2 with 20 students too got 54.62 (score scale 0 – 100). From some of descriptions above it, it can be seen that many of students who are not able to solve problem because learning process is meaningful to student that cause to low ability of students in solving problems. The reality is students just memorize the concepts and less able to use these concepts if it is encountered in real life problems that associated with concept that owned. Mathematics teachers have a duty to help students to improve students' problem-solving abilities. Teachers should strive harder to enable students to solve problems because one focus of learning mathematics is problem solving, so that basic competencies that should be owned by every student is a minimum standard of knowledge, skills, attitudes and values which is reflected in learning of mathematics with habits of thought and action to solve problem.

One of the efforts made to improve students' understanding of the material trigonometry can enhance the students' problem solving abilities with the use of cooperative learning model type Think-Pair-Share (TPS) and type Student Teams-Achievement Division (STAD) in order to increase students' problem-solving ability. When researchers put forward this to teacher of mathematics in SMA N 1 Perbaungan, they welcomed the idea so that the students are used to learning state centered on teachers who use the lecture method can be immediately abandoned. From this the researchers wanted to see how the students' problem-solving ability through the use of cooperative learning model type Think-Pair-Share (TPS) and type Student Teams-Achievement Division (STAD) in studying this topic trigonometry.

Based on the above background, the authors are interested to research this with the title : "**The Difference of Students' Problem Solving Ability by Using Cooperative Learning Model Type Think-Pair-Share (TPS) and Type Student Teams-Achievement Division (STAD) in the Topic of Trigonometry in Grade X of SMA Negeri 1 Perbaungan A.Y. 2013/2014**".

1.2 Identification of Problem

Based on background that have been raised it can be identified several problems, as follows:

1. Students' mathematics learning outcomes is still low.
2. Mathematics is regarded as a difficult subject.
3. Learning activities are still teacher-centered.
4. Students' mathematical problem solving ability is still low.
5. Knowledge of teachers to various teaching models are not optimal and not yet implementation of cooperative learning model Think-Pair-Share (TPS) or type Student Teams-Achievement Division (STAD) in the learning of mathematics.

1.3 Limitation of Problem

For more directing this research so focused and specific to the problem in this study is limited to the students' problem-solving ability on the subject of trigonometry grade x in SMA N 1 Perbaungan A.Y. 2013/2014 as well as the learning model is applied in the model limit by cooperative learning model type Think-Pair-Share (TPS) and type Student Teams-Achievement Division (STAD).

1.4 Formulation of Problem

Based on the above problem definition, then the formulation of the problem in this research : is there any difference students' problem-solving ability taught by cooperative learning model Think-Pair-Share (TPS) type with Student Teams-Achievement Division (STAD) type in the subject of trigonometry in grade X SMA Negeri 1 Perbaungan A.Y. 2013/2014?

1.5 Research Objectives

The purpose of this research : to know any difference students' problem-solving ability taught by cooperative learning model Think-Pair-Share (TPS) type and Student Teams-Achievement Division (STAD) type in the subject of trigonometry in grade X SMA Negeri 1 Perbaungan A.Y. 2013/2014?

1.6 Benefits of Research

The benefits of this research are :

1. Being incoming material for researchers as mathematics teacher candidates to apply cooperative learning in every learning process especially TPS type and STAD type in learning mathematics, especially on Trigonometry.
2. For teachers and prospective teachers, this study could be a reference in planning learning trigonometry particular subject.
3. For students, is expected to use the cooperative learning model type Think-Pair-Share (TPS) can improve the students' problem-solving ability.
4. For schools, is expected to be a source of information or contribute ideas for improvement of mathematics teaching, especially in schools where the research conducted and the school in general.
5. A comparison may be relevant for future research.

1.7 Operational Definition

To avoid differences in interpretation of the terms contained in the formulation of the problem in this study, the operational definition be stated as follows:

1. Mathematical Problem-Solving Ability in this study is the result of student learning in solving problems on material trigonometry to problem solving stages as follows:

- Understanding the problem
 - Make a plan
 - Do the plan
 - Checking solution
2. Learning model is a plan or a pattern that is used as a guide in learning in the classroom.
 3. Cooperative learning is learning that emphasizes the involvement of the student in the form of a group to achieve a common goal.
 4. Cooperative learning model type Think-Pair-Share (TPS) is a cooperative learning that every student is given the opportunity to think about it first answer to the problem that has been given, and then made in pairs and then share them with others in a way presentation results of group discussion.
 5. Cooperative learning model type Student Teams-Achievement Division (STAD) is one type of cooperative learning model using small groups with a total membership of each group of 4-5 students are heterogeneous.

In the process of learning, STAD cooperative learning consists of six steps or phases:

- a. Delivering learning objectives
- b. Presents or deliver material
- c. Organize students into groups to learn
- d. Guiding the work and the working group
- e. evaluate
- f. Giving award.