**CHAPTER I**

**INTRODUCTION**

1. **Background**

Humans are intelegent beings that have an intelligence so that can be used for thinking. Thinking is a process of linking the fact held for produce a proper conclusion in the matter. Even the development of technology, medicine, science, and the others fields today are the result of thinking process.

Thinking is using the mind (to consider, decide, etc. of something); considerin in memory (Depdiknas, 2014). There are some expert define about thinking. Costa in Kowiyah (2012) states that thinking consist of the activity or process as finding the law of cause and effect, giving meaning of something new, detecting regularities among the phenomena, determining of the qualiry (classification), as well as finding a special characteristic of phenomena.

Thinking is a mental activity that involves the brain. Overall, thinking involves personal mindset and the feeling of human. Beyer (1987) states that thinking is a mental activity by each individuals that obtained based on experience. Thinking divided into two that os low-order thinking and higher-order thinking. Higher-order thinking is a process of thinking that does not only about memorizing and giving an information of fact as feedback. In general, there are some aspect that show a higher-order thinking ability that is critical thinking, creative thinking, and problem solving.

Throne and Small in Rofiah (2013) state that creative thinking includes createing, discovering, imagine, suspecting, designing, propose an alternative, create and produce something. Establishing a creative idea means emerge with something unusual, new, or bring a solution to a problem. Someone’s ability can be shown through several indicator, for example propose new ideas, ask questions, dare to experiment, an plan the strategies.

Galbreath (1999) propose that, in the age of knowledge, intellectual capital, especially high-order thinking, is the needs for a reliable worker. Accordingly, Costa in Lilisari (2000) categorize complex thinking processes or higher-order thinking into four groups which include problem solving, decision making, critical thinking, and creative thinking. Creative thinking is one kind of higher-order thinking. McGroger (2007) define that creative thinking is the think that led to the acquisition of new insights, new approaches, new perspectives, or new ways of understanding things.

Based on Holland (Mann, 2005) creative thinking of mathematics has some components which are fluency, flexibility, originality, elaboration and sensitivity. Therefore, there are four phase in creative thinking that is preparation phase, incubation phase, illumination phase, and verification phase.

In relation to learning mathematics for example, creative thinking can be used to solce mathematical problems. The importance of creativity in mathematics presented by Bishop (Pehnoken, 1997) which states that a person requires two mathematical thinking skills, which are creative thinking that is often identified with intuition and analytical thinking skills that identified with the ability to think logically. Creative thinking process in solving mathematics explained by Perrenet and Taconis (2009) that found from their research that when a respondent found a new problem, then they formulized it correctly whatever the possible method that can be used.

Pehkonen (1997) said that creative thinking of mathematics also means a combination of logic thinking and divergent thinking that based on intuition but still in sense. When someone aplly creative thinking in solving problem, the divergent thinking generate many idease. This is can be used in solving the problem.

Creative thinking is very closely related to the study of mathematics, especially in solving mathematical problems. Although solving problem have a role in develop the ability of creative thinkin, but not all kind of problem can support that ability. Based on Hashimoto (1997), problem that has potention to develop creative thinking ability is an open ended problem.

The ability to think creatively that is different for each person refers to the development of ideas and inventions are more diverse results. The question now is how the ability to think creatively of someone who has a high mathematics ability? Sumarno (2013) in his research identify the order of student’s creative thinking based on mathematics skill and shows that student with high mathematics skill comply the component of creative thinking or had the ability of creative thinking is high. Based on this, researchers interested in conducting research that is "*Description of Creative Thinking Process of Students with High Mathematics skill in SMAN 1 Maros*".

1. **Question of Research**

Based on the background that have been explained. The question of this research are

1. How is the description of creative thinking process of students with high mathematics skill in SMAN 1 Maros seen from four components of creative thinking which are fluency, flexibility, originality, and elaboration?
2. How is the description of creative thinking process of students with high mathematics skill in SMAN 1 Maros seen from the phase of creative thinking which are preparation phase, incubation phase, illumination phase, and verification phase?
3. **Objective of Research**

According to the focus of research that have been expressed, the purpose of this research was to determine the the description of Creative Thinking Process of Students with High Mathematics skill in SMAN 1 Maros

1. **Problem Limitation**

To avoid the different interpretation of terms in this study, it is necessary to limit the understanding of the terms used.

1. Creative thinking is a series of mind activities who has high mathematical ability who reviewed the preparation phase, the incubation phase, the illumination phase, and verification phase that fill the four components of creative thinking that is fluency, flexibility, originality, and elaboration.
2. Fluencycan be seen from the spark many ideas of student, answer or problem solving as well as giving or suggest many ways to do things.
3. Flexibilityis defined as the students can look at things from a different perspective, look for a lot of alternatives, or can change the perspective or thinking.
4. Originality is defined as the students can give at least one new way to find the correct answer, or use the right way though not find a new and used it in at least one new answers.
5. Elaboration is defined as a student can develop ideas and refine the details.
6. The preparation phase is defined as the initial efforts of students in solving problems.
7. The incubation phase is defined as a condition where the students get information / issues, organize facts or concepts that are understood to find ideas in solving problems.
8. The illumination phase is a condition in which the students find the idea after experiencing the incubation phase and use them in solving problems.
9. The verification phase is defined as condition where students test out ideas that have been found at the illumination phase and use them in solving problems, and test answers were found.
10. Non-routine mathematics problem a mathematics problem that can not be solved by usual way that usually used by the students.
11. Student with high mathematics skill is student with high mathematics score that has achievement in mathematics.
12. **Benefit of Research**

The benefits of this research are:

1. Theoretical benefits
2. As reference to other research related with description of creative thinking or creative thinking process.
3. As an information that related to description of creative thinking of students with high mathematics skill.
4. Practical benefits
5. For the government, is an effort to improve the quality of education and optimize students' ability to think creatively.
6. For the teacher, as a reference to develop students' ability to think creatively.
7. For the author, can expand the knowledge of creative thinking abilities, creative thinking processes of students with high mathematical ability.

**CHAPTER V**

**CLOSING**

1. **Conclusions**

Based on the results of data analysts concluded that:

1. Components of creative thinking of students first subject (S1) seen from the three test item creative thinking process fulfills the current thinking is to give a lot of ways and think of many answers, creative thinking fluent components can be seen from the answers given that bervarias think kreatifi, components thinking creative original views of the subject that provides a new way of constructing answers, as well as the elaboration of creative thinking components contained in the development of a given idea.
2. Components of creative thinking of students the subject of a second (S2) seen from the three test item creative thinking process fulfills the creative thinking well, ie the subject gives a lot of ideas to resolve the matter. Components of creative thinking can be seen from the S2 eloquent answer varies. Components of creative thinking that is original can be seen from the S2 provides another way to find new answers. While the components of creative thinking that elaboration can be seen from the development of the idea of the answer.
3. The process of creative thinking of students for first subject (S1)
4. Preparation Phase

At the preparation phase after reads matter, S1 trying to understand the problems with imagine the question that have been given (WS1-01). After reads the question, then S1 starts to build the ideas to solve problems by thinks of concepts that can be used to resolve the matter. Generally, in working the question S1 find the idea by watching the matter closely and clarify questions that have been given.

1. Incubation Phase

At this stage, S1 began sets the concept to find ideas in the matter. Before finds ideas, the activities conducted by S1 to find ideas is imagines and shake his pen, recalls the formula and the matter has been done before.

1. Illumination Phase

In the illumination stage S1 had the idea to work on the problems. S1 can finds ideas to work on the problems with remembering formulas and problems ever done before. The idea was triggered by memories of S1 on the question has been done before. Then after the idea came then S1 immediately try to work on the problems.

1. Verification Phase

At this stage of phase, activities performed by S1 is test ideas that have been obtained at the stage of illumination and use them in the matter. S1 feels confident with the idea that the obtain by looking back at a connection between the questions and answers. S1 then uses these ideas in solving problems and retest to assure the answer by looking back problems began and see the possibility of errors in the process. Based on this assumption, the way and the answer given has met the components of creative thinking that is fluency, flexibility, originality and elaboration.

1. The process of creative thinking of students for second subject (S2)
2. Preparation Phase

During the preparation phase S2 thinks of ideas and builds ideas for solving problems. S2 understands the problems by sees the problems and look for the keywords contained in the matter and think of the right answer. Then S2 think of the appropriate concept based on keywords derived from matter and find ideas to work on the problems.

1. Incubation Phase

In the incubation stage S2 begans to organize the concepts to find ideas in resolving the matter. Before finds ideas, S2 imagines about the problem while recalling about the question tha she has done. In addition at this stage S2 sometimes perform activities like doodling to find ideas. During the process of thinking idea, S2 remembers the appropriate formula and remember about the question that she ever does.

1. Illumination Phase

At this stage S2 begins to find ideas that will be used to resolve the matter. S2 remembers the in accordance with the matter and considering the question that sheever does that has similarities with the given problem. After getting the idea then S2 looks beforehand whether the idea obtained is right then she ries to do it. In general, the idea gained S2 based on keywords acquired in question.

1. Verification Phase

In the verification stage S2 began tests ideas to solve problems and test answers were found. S2 feels confident with the idea after watching back the questions and answers he got. While to find the answer, S2 underline keyword obtained then adjust with the use of appropriate formula to resolve the matter. After complets the questions, S2 noticed the answers to see whether there is an error in the application of the concept which she uses.

1. Another finding in research

In general, there was no significant difference between the creative thinking processes S1 and S2 where S1 is the first subject which is a men and S2 is the second subject is woman.

1. **Suggestion**

Based on the conclusions of research, the researcher suggests the following:

1. To develop the ability to think creatively it is necessary to develop an appropriate approach is through open-ended approach. Through this approach students are expected to develop students' skills in processing information and think about the possibilities of a possible answer.
2. To research relevant to meneiliti more creative thinking processes necessary to complete the selection of different materials such as three-dimensional composition or function as well as trying to identify the creative thinking process unit pasa different educational levels, for example at the university level.