CHAPTER 1
INTRODUCTION

1.1 Background

Education has a very important role in creating quality human resources (HR). Education is always concerned with humans, in the sense of being a conscious effort to nurture and develop basic human capacities as optimal as possible in accordance with their capacities.

The process of education carried out in the school is basically teaching and learning activities, which aims to have students the best results according to ability. One of the benchmarks that illustrate the high level of success of students in learning is the result of learning. Learning outcomes can be viewed from three aspects, namely cognitive aspects, affective aspects, psychomotor aspects.

In addition, teachers play a role as a determinant of student success in learning. This is stated in Law no. 2 of 1989 on the National Education System which says that the main key in advancing education is teachers because teachers directly influence, guide and develop the ability of students (students) to become the intelligent, skilled and moral man.

Mathematics education at the level of basic education has a very important role because this ladder is a very decisive foundation in shaping the attitude, intelligence, and personality of children. Therefore Mendikbud Wardiman Djojonegoro in his speech at the Southeast Asia Mathematics conference IV argued that the mathematics lessons given primarily at the level of primary and secondary education are intended that at the end of each stage of education, learners have a certain ability for the next life. But the reality shows the number of complaints from students about difficult, uninteresting, and boring math lessons. These complaints directly or indirectly will greatly affect the achievement of mathematics learning at every level of education.

Although efforts to overcome low mathematics learning outcomes have been undertaken by the government. Such as improving the curriculum, procurement of textbooks, increasing the knowledge of teachers through

upgrading, as well as conducting various research on the factors that allegedly affect the results of learning mathematics. But the reality shows that the results of learning mathematics are still far from expected.

As an exact science, mathematics can never be separated from the daily activities of human beings, among others in the industry, economy, education, even in determining the fall of a certain day, can be calculated using mathematical sciences. Therefore, it is important to inculcate the basics of mathematics from the beginning on learners, such as addition, subtraction, multiplication, and division. Thus, it is expected to ultimately help facilitate learners in solving a problem related to mathematics in everyday life.

One of the difficulties faced by grade V elementary students in learning mathematics is in working on the story problem, especially in understanding the story about integer count operation using the properties of counting operations, The biggest fellowship factor and east common multiple, and cube root. There are several causes of this may be possible, namely: the ability of students in interpreting the language of the problem is still lacking, the students have not been able to determine what is known and what is asked, and the ability of students in determining the mathematical model used in the solution of the problem.

In giving classroom and homework assignments to the students, the teacher is still not paying attention to the aspect of the story as one form of practice questions at home. The teacher is still focused on the exercises in the book. This lacks the space for students to develop their ideas in training their ability to solve problems that exist in math-shaped math problems. Based on the above reasons, it is necessary to do an observation to determine the extent to which the ability of students in solving mathematical problems, especially about the form of stories about integer count operations.

Based on the history of cognitive psychology, *Wallas* (in Solso, 2008) explains that there are 4 stages in the creative process, namely:

At the *preparation stage* in this case is to formulate a problem and try to solve it. An example is when we are faced with a problem to cross the river rather

wide with a fairly heavy current, we have several solutions to cross it. We have time to cross it by trying out what we think is the way out.

The *incubation stage* is basically using the subconscious to help solve problems. Incubation is a period in which no attempt is made directly to solve a problem and attention is diverted for a moment to something else. In other words, incubation is a way to solve a difficult problem if we delay the problem at a certain time lag and then work again. At this stage why did creative ideas not appear? in general, the pragmatic answer to the question is that most of the time we spend in our lives, we spend with things that are less demanding for us to think creatively like going out, watching tv, sunbathing.

In the *incubation stage*, when the problem solving process is deadlocked, let the mind rest for a while. Meanwhile our subconscious mind will continue to work automatically looking for problem solving. The ongoing incubation process will depend on information absorbed by the mind. The more information, the more material that can be utilized in the incubation process. the process of thinking about a problem subconsciously when involved in other activities.

The *illumination stage* is to gain insight (deep understanding) of the problem. Illumination is described as a "flash of inspiration", an idea that comes from nowhere. Actually this idea is a quick form of a process that is preceded by a period of information and incubation. Illumination then arises and involves establishing a connection between two elements that were not previously connected. Ideas are thoughts that pass quickly, unless we document. Therefore, a way to reduce the risk of losing ideas is to record the illuminations that exist so as to make ideas more embedded in our heads. When the *illumination* occurs, the bright path to the problem begins to open. Someone will feel an incredible sensation of excitement, because understanding increases, all ideas emerge, and these ideas complement each other to solve a problem, all breakthroughs of creative ideas emerge at this stage, telephone discovery, storyline and others - others are examples of how the *illumination stage* fills a person's mind.

In the last stage, namely *verification*, thinkers must critically examine and assess the solutions submitted at the illumination stage. If it turns out that the proposed method cannot solve the problem, the thinker should go back to undergoing the five stages, to find a new inspiration that is more appropriate. Verification tests the understanding that has been obtained and makes a solution. After an idea / solution is obtained, then the idea or solution must be tested. This stage is the stage for testing a product from the creative process to prove its legitimacy. The verification stage is generally shorter than the previous stage, because this stage only tests and reviews the results of one's calculations, or it can also to see if the findings are successful. But in various cases it takes time to carry out further research or review.

According to Bruner (in Suherman et al, 2001), mathematical learning will succeed if his teaching is directed to concepts and structures. In addition to Bruner, Piaget (Herman, 2006) also said that children at the elementary school age are still in the stage of concrete thinking and have not been able to think abstractly. So in the learning process should give teachers the opportunity for students to manipulate concrete objects. In addition, teachers in implementing learning for elementary school students should involve the help of concrete objects close to the child, as this will greatly underlie the understanding of the abstract concept of mathematics.

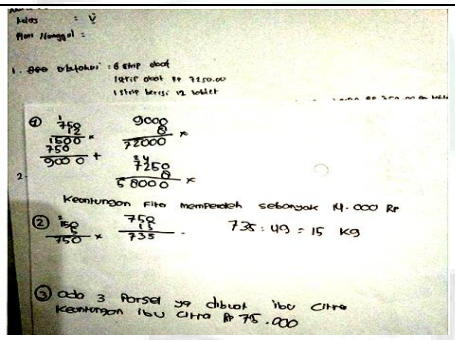
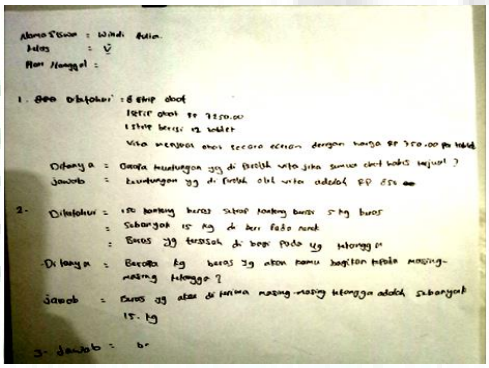
The importance of creativity in mathematics is proposed by Bishop (Pehnoken, 1997) which states that a person needs two mathematical thinking skills, namely creative thinking that is often identified with intuition and analytic thinking ability which is identified with logical thinking ability. While Kiesswetter (Pehnoken, 1997) states that the ability to think flexibly which is one aspect of the ability of creative thinking is an important ability that must be possessed by students in solving math problems. This opinion affirms the existence of the ability of mathematical creative thinking.

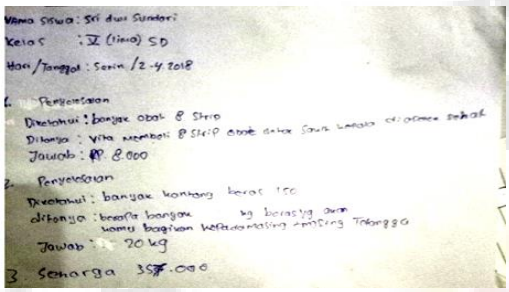
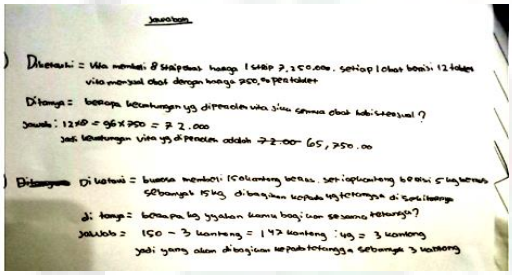
In this study, researchers will analyze the ability of mathematically creative thinking in grade V elementary school students in learning mathematics using metacognition approach. In formulating a creative settlement of an

important issue considering the same problem that has ever been faced. In this study, to measure the ability to think creatively, mathematics used the problem with the aspect or indicator of mathematical creative thinking used is in accordance with the opinion of Gilfred and Torrance (in Santoso, 2012: 454) there are four characteristics of creative thinking, namely: (1) *originality* (originality , compiling a new one); (2) *fluency* (fluency, decrease many ideas); (3) *flexibility* (flexibility, easy change of perspective), and (4) *elaboration* (elaboration, developing other ideas of an idea). With the students' diverse answers, students have fulfilled one of the creative thinking ways of fluency.

Here are the results and answers of various students are presented in the form of tables 1.1

Tables 1.1 Result of Observation

Answer to Student	**Found Errors**
	Students try to answer the question but the answer is still wrong because it does not equate between the results of the calculation with regular. Students also do not answer questions in the form of a story.
	Students only answer 2 questions and the answer is still wrong because the calculation operation is not correct. Students also do not understand the problem well

	Students only answer 2 questions wrongly without comparing between the right and the left. Students just write a few sentences that are not clear in answering the story
	Students try to answer two questions but the two answers are still wrong when working on the process because students do not understand how to work properly

Based on the observations in SD Negeri 095552 that have studied the matter of integers indicates that most students make mistakes when solving the story related to the integer. Based on the students' answers, the results obtained from the observation, indicate that the ability of students in solving the problem solving about the story of integer count operation is still very less creative. This can happen because the students do not through the verification phase of the students first have to test every new idea or idea that will application in the final answer to ensure the answer is true or not. Students also find it difficult to apply the problem to their real life.

This difficulty can actually be overcome by Scaffolding is by providing sufficient assistance to students based on the form of difficulty experienced by students. Scaffolding was first conceived by Vygotsky, a psychologist from Russia, further popularized by Bruner, an expert in mathematical education. Vygotsky expresses the idea of Zone of Proximal Development (ZPD) and Scaffolding according to Supiyani (in Chairani, 2015: 40).

So it can be concluded that the understanding and ability of students in solving the problem of calculating integer numerical operations using the steps of problem-solving is still said to be low and below the average value of graduation limit.

Research that is being developed in predicting student response is *Hypothetical Learning Trajectory* (HLT). Simon (in Ramadhanti, 2015: 90) first introduced the *Hypothetical Learning Trajectory* (HLT) to characterize the reflexive nature of the learning design and consideration of student learning difficulties in the classroom. Then Klaassen in (Samudra, 2012) has adopted the *Hypothetical Learning Trajectory* (HLT) scenario concept focusing on the interaction of learning and teaching process. *Hypothetical Learning Trajectory* (HLT) is a learning path provided by teachers based on the idea of choosing a specific special design so that the concept of elasticity can be understood by the students.

The development of HLT is formulated in three components: learning objectives, learning instruments to be used, and Hypothetical Learning Process that anticipates how students' critical and creative thinking processes are developed. So in developing a design of learning design, it is necessary to formulate *Hypothetical Learning Trajectory* (Risnanosanti 2012).

Then, from the interviews of 3 students from the same class, they found that they did not understand how to solve the story problem in Integer material, they did not understand the material presented by the teacher because the language is difficult to understand students, plus when the activity learning to teach the delivery of material given the teacher directly to the point, then provide practice to students. So that only a few students can accept what the teacher is saying and the lack of student interest in mathematics. So they have difficulty in solving the story problem in the material of integers.

Though teachers should pay attention to the level of understanding of each student. So that the delivery time of the material to the students can be determined whether sooner or later, not generalized entirely. Especially in explaining examples of stories related to integers so that students can understand what is

delivered by the teacher and able to solve the problem of the story correctly. In addition, teachers should no longer be tied to conventional learning, teachers should apply appropriate learning models to improve student problem-solving skills.

Based on these problems, of course, there must be an evaluation and improvement that must be done, one of them through the activities that researchers will do that is by analyzing what are the errors of students in solving the story problem, find the cause of the error, whether the error comes from teachers or students itself and then find the right alternative solution so that the above problems can be solved.

The topic of integers is chosen because there are many stories that require students' ability to read problems in the story, understand the story, transform into the mathematical model, the skills in the process of answering and also the writing of the final answer. Similarly, the model of learning, problem-based learning in the metacognition approach is chosen because in this learning model aims to train students to be able to solve problems.

Based on the above background, the researcher is interested to conduct research with the title " **Trajectory Of Creative Thinking Mathematics On The Matter Of Integers By Applying Metacognition Approach To SD Negeri 095552 Jalan Asahan Siantar Of Learning Year 2018/2019**". This study aims to describe the process of creative thinking so that this research is expected to produce an appropriate learning plan in teaching students of class V SD Negeri 095552 during the process of metacognition approach takes place on the matter of integers.

1.2 Problem Identification

Judging from the background of the problem, then that becomes the problem identification that is:

1. The ability of mathematical creative thinking is still rarely dilation and used as a target teacher to students for learning in school.

2. The ability of students with learning paths related to creative thinking with metacognition approaches is still lacking.
3. Students are only faced with problems that are closed that is the problem that only has one answer so that students have less chance to develop creativity.
4. Students consider mathematics difficult and boring.

1.3 Problem Limitation

Seeing the scope of problem identification is very broad, the researchers limit the problem on the ability of creative thinking mathematics, trajectory of creative learning in mathematical problem solving, the stage of creative thinking process of mathematics and this research conducted in SD Negeri 095552 Jalan Asahan Siantar with the subject of the study of class V students with the number of students 31. Furthermore, the subjects taught are "integers" in grade V elementary students.

1.4 Problem Formulation

Based on the background of the above problem, the authors formulate the problems in this observation as follows: The extent to which the ability of students in solving problem-solving problems about the story of integer operations.

1. How the ability of the creative thinking mathematics on the matter of integer with the approach of metacognition of students of grade V SD Negeri 095552?
2. How is the trajectory of the creative thinking mathematics on the matter of Integer with metacognition approach that will be traversed by grade V students SD Negeri 095552?
3. How is the stage of the creative thinking process of mathematics and cognitive knowledge on the matter of integers with the metacognition approach of grade V students of SD Negeri 095552?

1.5 Research Objective

From the formulation of the problem that has been stated above, then this observation aims:

1. Knowing the ability of creative thinking mathematics in the matter of integers with the metacognition approach of students of grade V SD Negeri 095552.
2. Knowing the trajectory of creative thinking mathematics on the matter of integers with the metacognition approach that passes students of grade V SD Negeri 095552.
3. Knowing the stages of the creative thinking process of mathematics and cognitive knowledge on the matter of integers with the metacognition approach of grade V students of SD Negeri 095552.

1.6 Research Benefits

This observation is expected to provide benefits for all authors, teachers, and students of class V SD Negeri 095552, especially that is:

1. For students
   a. Increase students' understanding of stories
   b. Can solve a problem related to mathematics in everyday life
   c. Can motivate in learning.
   d. Familiarize students to think creatively about solving problems that are facing him
2. For teacher
   a. Prepare a relevant strategy for solving the story in the future, so that the problems that arise can be reduced.
   b. Extend insight into teacher knowledge and skills.
   c. Provide an idea of the level of students' creative math skills.
   d. Can be used as a reference for teachers in developing the ability to think creatively mathematically.
3. For observer
   a. Expected to broaden insights on problem-solving in helping students with learning difficulties.

b. This observation as reference material for other researchers who will conduct similar research in the future.
c. Giving scientific contribution to the development of science especially with regard to the ability of students' mathematical creative thinking.

1.7 Operational Defenition

To be able to perform research variables qualitatively, then the variables are defined as follows:

1. Metacognition is how he controls and adapts his behavior in the cognitive domain.
2. Solving mathematical problems is a process of completion through appropriate strategy steps in solving them.
3. Mathematical stories are issues related to daily life expressed in meaningful sentences.
4. The ability to think creatively is the knowledge possessed by students to find creative and innovative solutions in the form of conceptual knowledge, reasoning ability, knowledge of the ability to connect concepts with other disciplines and knowledge of students' mathematical intuition.
5. The path of creative learning of mathematics on the metacognition approach model is a conjecture of the mathematical creative learning route that students pass on the metacognition approach model.
6. Stages of the creative thinking process of mathematics is a route of the creative thinking process of the mathematics of students, starting from the stage; orientation, preparation, incubation, illumination, and verification.
7. The path of the creative thinking process of mathematics is the trajectory of the creative learning of mathematics which is achieved through the stages of the creative thinking process with the mathematical cognitive knowledge held by the students.