

## INCREASING MATHEMATICS ACHIEVEMENT WITH ACTIVE LEARNING IN ELEMENTARY SCHOOL OF NORTH TAPANULI, INDONESIA

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### ABSTRACT

*The active learning has an important role in Mathematics education for Elementary School. This research aims to know the level of activity and the result of students' Mathematics learning in the 5<sup>th</sup> grade of Elementary School No. 177657 Siabalabal District Sipahutar, North Tapanuli in 2015/2016 on the activity learning to study Ratio in the material of decimal and percentage. This research is descriptive research and as a tool of collecting the data, it is used the analysis test and observation of students' activity. From the result of analysis data, it is obtained: 1. The level of students' activity in the first learning is 75,38 (very active) with the average reliability level of students' activity is 76,92% (medium), and the level of students' activity in the second learning is 86,15 (active) with the average reliability level of students activity is 84,61% (high); 2. The active learning in studying ratio in the material of decimal and percentage in the grade of 5<sup>th</sup>, the achievement has been completed with the detail as follows: a. the level of students' mastery classically is 78, 79% with categorized as medium, b. the absorption of student individually is obtained 26 of 28 students or 92, 31% from completed subject, c. the objective achievement of special learning is 75% for overall.*

**Keywords:** Active learning, Elementary school, Math education, ratio, Action research

### INTRODUCTION

Active and contextual learning is highly relevant to develop both material and formal aspects, even more so on the formal aspects such as *Train thinking and reasoning* that include investigation, exploration, developing divergent thinking, developing problem-solving skills, developing the ability to communicate ideas through graphs and diagrams. The importance of the students doing their own investigation becomes very clear if we realize that learning Mathematics is actively participating and not like watching a sports match. The number of investigations and findings by the students determines: what they learn, how long they can keep what they have learned, the ability to apply them, the behaviors that arise during the learning.

Children learn at their own pace and dexterity, and also with their distinctive style when the child is ready. The teacher's responsibility here not only encourages and motivates the readiness by providing a supportive environment, but is also responsible for equipping it with diverse and effective experiences. In the condition of how pupils can learn effectively, how teachers can create the situation, this question is answered if the learning condition is related to the expected result. If only the understanding of mathematical operations is desired, then the learning process that is memorizing, drill and repetition, is very adequate.

The expected outcomes of today's Mathematics courses are much broader and deeper than mere mastery of mathematical operations. For that, the activities and creativity of children / pupils to find ideas, principles, rules and principles of Mathematics, students are directed to the development of concepts and the accuracy of terms. It easier to memorize "a word" rather than remembering a meaningless "letter set", easier to remember numbers declared by numbers in a systematic pattern rather than a random array. Similarly, learning Mathematics can be done effectively and efficiently when the emphasis is on the structure, organization and relationships between what has been learned. Students must experience the event by themselves, initially recognize the idea at a concrete level, and then gradually introduce the technical language to express the idea. The end result is that they can work actively and effectively at the level of the abstract symbol.

In terms of the learning process, the teacher's lecture activities show improvement, while teacher-student interaction, student activities conducting discussions, explorations, and investigations related to mathematical ideas, shows decline though such learning activities will train students in finding and thinking high level in solving problems. To learn math, students need direct interaction with their environment. Interact directly with the environment can develop the sensitivity / sense of students to the field of mathematical studies. Interaction with the environment can also enable students in learning. Student activeness in learning is important so that they understand math well. "The real world", in the learning of Mathematics is used to build mathematical concepts and as a place to apply them. Activeness in active learning is more in the form of mental activeness although there are also manifested with physical activeness (Setiawan, 2010). Thus, Mathematics is not given in the finished form, but Mathematics as an activity. Mathematics is the study of patterns, relationships, and logical thinking, then should the learning of Mathematics is investigating and / or finding a pattern / relationship that simultaneously trigger and sharpen logical thinking.

Based on the background of the problems above, the author wants to make a study of "Active Learning to Study the Ratio in the Material of Decimal in Elementary School N0.177657 Siabalabal, Sipahutar District, and North Tapanuli Academic Year 2015/2016".

### **Identification of problems**

Identification of problem in this research are: (1) Different cognitive level of student, (2) Different experience / level of student development, (3) Teacher taught Mathematics by giving definition / concept then examples of problem, (4) Student Only skilled solving math problems, (5) Math is an activity to investigate and find patterns / relationships rather than simply receiving and memorizing information

### **Limitation of Problems**

This study is limited to active learning to study the ratio on decimal material and percent in 5<sup>th</sup> grade of Elementary School.

### **Formulation of Problem**

Based on the background then the formulation of the problem in this study are: (1) What is the activity level of students of 5<sup>th</sup> grade of Elementary School N0.177657 Siabalabal, Sipahutar District, North Tapanuli Academic Year 2015/2016 on active learning to study the ratio in the material of decimal? , (2) How is the result of the study of the students of 5<sup>th</sup> grade of Elementary School N0.177657 Siabalabal, Sipahutar District, North Tapanuli on active learning to study the ratio in the material of decimal? ".

## OBJECTIVES OF RESEARCH

This study aims to find out: (1) The level of activity of the students of 5<sup>th</sup> grade of Elementary School N0.177657 Siabalabal, Sipahutar District, North Tapanuli in academic year 2015/2016 on active learning to study the ratio in the material of decimal, (2) conditions of pupils in Elementary School N0.177657 Siabalabal, Sipahutar District, North Tapanuli, Academic Year 2015/2016 on active learning to study the ratio in the material of decimal.

### Benefits of Research

The expected benefits after the end of this study are: (1) As input materials to design a lesson that activates students in learning, (2) Active learning as in this paper can be designed for other mathematical material.

## REVIEW OF LITERATURE

### The Understanding of Mathematics Learning

Learning is a deliberately designed process with the aim of creating an environment that allows a person or learner to undertake learning activities and the process is guided by the teacher. Mathematics learning should provide opportunities for students to try and find experience in learning Mathematics (Sardiyanti, 2010). Mathematics is the main branch of philosophy. The science of philosophy is the science that became the mother of all knowledge. Thus, the teaching of Mathematics becomes one of the main things in instilling basic science values to the students.

There are three points of view that can be used to determine the success of students in learning Mathematics that is reasoning, process and outcome. Remembering these three points of view are related to each other, the Mathematics lessons must be done carefully by the teacher in order to obtain optimal results (Gusmita, 2014). According to Hudojo (1988: 122) that: "Learning Mathematics will be successful if the learning process is good, which involves intellectual child / learners optimally". Each rule at a higher level requires mastery of rules at a lower level. Learning that requires rules at some stage requires mastery".

From the declaration above, it can be stated that in studying a higher / difficult rule, it must have already mastered the rules at the level below it as a foundation in solving more difficult problem; a student learns Mathematics based on what he already knew, then the student will find it easier to study the next math topic. In other words, the past learning experience of the students will influence the success of the Mathematics learning process of the child, meaning that learning Mathematics is a mental / psychic activity that should involve the child's intellectual optimally, and requires a lot of regular and routine training so as to produce Changes of knowledge and understanding of the child in Mathematics.

### Theory of Multi Intelligence Learning (Multiple Intelligence)

In general, each individual has different intelligences from each other. Similarly, students have different intelligences with each other. In reality everywhere, humans differ from each other in many ways, among other things, intellect, talent, interests, personality, and social circumstances. However, differences in intelligence are not an obstacle in solving problems, especially in the process of teaching and learning in school. Gardner (in M. Assidiq et al) gave the definition of *multiple intelligence* are "An intelligence entails the ability to solve problems or fashion products that are of consequence in a particular cultural setting or community. The problem solving skill allows one to approach a situation in which a goal is to be obtained and to locate the appropriate route to that goal".

Man's behaviors are governed and controlled by his own brain. The products of the brain include mind (reason) and feelings (emotions) as mood or impulse to act. The human brain has three aspects, namely rational-logical or Intelligence Quotient (IQ), emotional-intuitive or Emotional Intelligence (EI), and Spiritual or Spiritual Quotient (SQ) (Gardner in Hasratuddin, 2016). IQ is believed to be quite stable throughout a person's life, while the level of intelligence can change positively (through) teaching and awareness or change negatively (reduced) due to lack or not used ". This means that a person's intelligence can develop optimally when sharpened and given the appropriate approach in the learning that goes on and vice versa, the intelligence will decrease if rarely or never used in learning. Garner (in Rayesh, 2016) suggested 8 multiple intelligences that humans possess, as well as the following intelligences:

1. Linguistic Intelligence
2. Logical-Mathematical Intelligence
3. Spatial Intelligence
4. Kinesthetic-Physical Intelligence
5. Musical Intelligence
6. Interpersonal Intelligence
7. Intrapersonal Intelligence
8. Naturalist Intelligence

The main idea of multi-intelligence theory is that human beings have the ability to enhance and strengthen intelligence, intelligence can change but can also be taught to others, intelligence is a compound reality that appears in different parts of the brain system or human hemisphere, at certain levels This intelligence is a unified whole. Every child needs to have the opportunity to develop minimal intelligence in various dimensions (musical, gestures, visual, spatial, mathematical logic, linguistic, intrapersonal, and natural spiritual and existential). Thus, the learning that applies the theory of multi-intelligence learning, students play an active role in the classroom, with the record of the teacher should note that not all students have the same intelligence.

### **Early Mathematics Learning**

Teachers who agree with the theory of transmission (transmission theory) usually tend to organize their classes so that students can listen to teachers better and can look to the board. He will try to create a conducive to environment so that students can capture the knowledge taught. Often with a closed book he tests to see if the student has understood the concept he taught. Mastery of materials is usually examined by holding a test (exam) or check whether students can work on the questions in the book. The props are used as a complement and not as an integral part of the teaching of Mathematics. Sometimes students are told to try a game after completing their training questions. Such teachers are basically happier if students do not use support tools.

Teachers believe that children know by themselves if they grow older and interact naturally with their environment tend to avoid a traditional view of the pupils. They encourage their students to investigate on their own through their guidance. So many teachers interact with their students.

The constructive teacher's role are (1) providing a variety of surroundings; (2) Establishing routine activities that maximize the time available for students to interact with teachers and

friends, as well as the objects around them; (3) Asking provocative questions that make the student think and rethink all the answers in response to the question being discussed. The problem can be a game or a puzzle, repetition, exercise questions, or spoken conversations between teachers and students. Far from simply a support tool, props are an integral and essential part of a program or teaching of Mathematics.

Constructive teachers tend to consider the level of student development and class and age levels in determining the components of Mathematics learning. If a child demonstrates the level of preoperational thinking, the teacher will provide mathematical activities that emphasize the less abstract aspects. The activities can be stacking objects, grouping into simple groups, naming, counting, and finally writing down the results. If the student exhibits concrete operational levels, constructive teachers will provide activities that emphasize more aspects of the relationship of Mathematics. Such equations, rules and attributes can already be introduced. Disciples find, for example, that five loaves of bread combined with two loaves equals two loaves of bread combined with five loaves of bread. Using the symbol they then write  $5 + 2 = 2 + 5 = 7$ .

In constructive classrooms, the teacher sometimes speaks to the whole class, sometimes works with a small group, and sometimes moves around the class and stops for a few minutes to ask a provocative question, talks about time patterns or interesting answers, or give a new problem. Master tries to create an atmosphere rich in challenges, stimulating interactions with people, objects or ideas.

### **Learning To Increase Student Activity**

In learning, activity is necessary. Because in principle learning is to do, do to change the behavior to do the activity. There will be no learning if no activity. That is why activity is an important principle or principle in the interaction of teaching and learning. In learning, the more activity is the student itself, while the educator is a facilitator and provides guidance and plans all activities that will be done by students (Sardiyanti, 2010).

In the current study that is expected to be an active student, students are directed to seek out and discover for themselves the concepts. In the learning process the teacher must create an atmosphere in such a way that students actively think, ask question, put forward ideas, experiment, practice the concepts learned, and be creative. Learning is an active process of the students in building their knowledge, not a passive process that only receives a teacher's lecture on knowledge. If learning does not provide an opportunity for students to think actively, then the learning is contrary to the nature of learning.

A concept (e.i, summing, multiplication, waking flat, and others.) described through lectures is actually very difficult for students to comprehend because the concept is explained abstractly. Abstract is difficult to understand because the thinking level of children who tend to be concrete will be easier if stated / delivered with the real form. If in teaching teachers use media such as pictures, movies, demonstrations and so the concepts learned become more concrete (real) and more easily understood students. But the easiest to make concepts into concrete is when students engage in direct experience and actively find themselves from the experience a concept that is the goal of learning. For example students find themselves meaning of summation after they are involved in the sum total activity using real objects (peanut, gravel, paper clip). The real experience and implementation process provides a way for them to build their own active understanding of the concept of addition.

Edgar Dale (1946; USAID: 2013, 14) showed that a variety of media or activities can be used to teach a concept and its relationship to the concrete level of concepts that can be conveyed.



Learning that depends only on verbal course (lecture, reading) contains the highest abilities, while the direct experience that makes students actively discover and apply a concept has the highest level of reality. Edgar also argued by saying that "I heard, I forgot; what I see, I remember; what I do, I understand". The opinion was also added by Melvin the author of 101 Active Learning Ways that support the liveliness of students to provide maximum learning results by saying; "What I heard, I forgot; What I hear and see, I remember; What I hear, see, ask, or discuss, I begin to understand; What I hear, see, and I discuss and do, I gain knowledge and skills; What I teach others, I know." The active role of the student is crucial in the formation of a creative generation, capable of producing something for him and others. Broadly speaking, the learning that is carried out in the classroom should illustrate the following points:

1. Students engage in various activities that develop their understanding and abilities with an emphasis on learning through doing.
2. Teachers use various tools and ways to inspire students' learning spirit and help students build their knowledge and understanding. These ways include using the environment as a learning resource to make learning interesting, fun, and suitable for students.
3. The teacher organizes the class by displaying books and learning materials that are more interesting and provide a reading corner.
4. Teachers implement more cooperative and interactive teaching, including group learning.
5. Teachers encourage students to find their own way in solving a problem, to express their ideas, and engage students in creating their school environment.
6. The role of the teacher as a facilitator is not a lecturer, meaning that the teacher designs an active learning activity, during the learning activities, the teacher no longer stands in front of the class explaining the subject matter, but goes around monitoring student activities and helping students in the learning process.

### **Briefing to Learn Ratio in Decimal Material**

The term ratio has been used in daily life without using the ratio of the ratio itself, so studying it formally in the class makes it complicated. Students who like soccer for example, can say "The A successfully received 15 of 25 operands", but when asked how much the number of operands received by A compared with the total operands he has tried, the student can not answer. Use of a broader ratio e.g; 70 kilometers for 10 liters of gasoline (ratio of 70 to 10 or 70: 10 or 70/10); 80000 rupiah for 6 bundles of *rambutan* fruit (ratio of 80000 versus 6 or 80000: 6 or 80000/6).

One lesson talks about leaves. The purpose of the experiment is not deliberately notified to the student, so the student will act as if it were a scientist investigating a phenomenon and not knowing exactly what it will gain. Teachers group students into groups of 4, and each group works in a separate table. Each group is given a ruler marked with centimeters and millimeters, and about 10 leaves. After looking at the leaves, each group concluded that: The leaves are different in size. All the leaves seem to come from a same tree. Leaves given to one group come from different trees given to those given to other groups. Some leaves are bright green, while others are somewhat yellowish.

After hearing the temporary conclusion of the student, the teacher then asked, "For each leaf what should we measure?" Then the student may reply, "The leaf stalk", "length", "width".

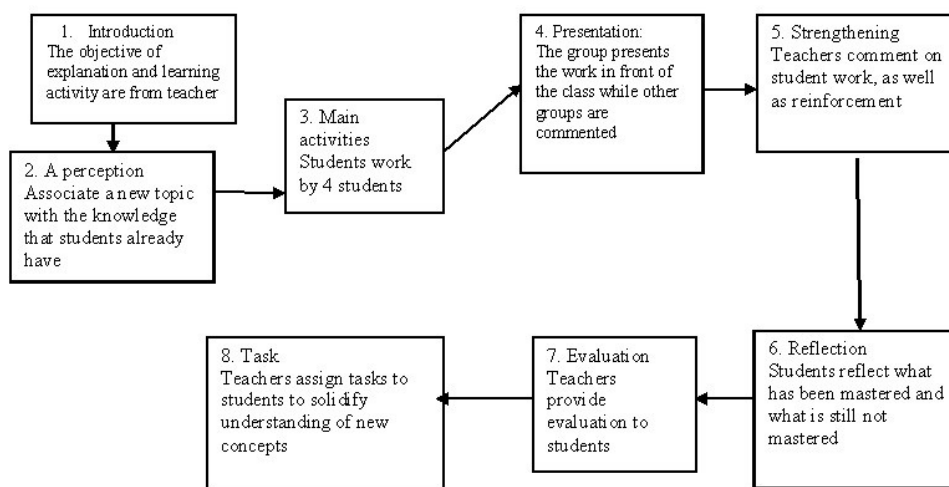
Because of the various answers, the teacher can straighten out by saying, "The length of the leaf is measured by not including the petiole, while the leaf width is measured at its mid length." Each group completed the measurement and recorded the results. From the result of the experiment / observation the students will find the ratio between the length and width of each leaf will be close together.

Percent is one of the most widely used mathematical concepts in daily life, such as the statement "that the cost of living has risen by five and a half percent, the rate of economic growth has increased by the percentage, the price of staple goods in the supermarket discount is twenty percent, Two percent, unemployment rate is only five percent, traffic accidents fell by fifteen percent compared to last year ", and so forth. This is one proof that we have to re-examine the teaching of percent. Error use percent can cause a huge loss. For example, someone who borrows money at a rate of ten percent, whereas what actually happened he paid with interest rates far greater than ten percent.

Learning with graphical representation can help to understand the concept of percent. Create a 10x10 square mimeograph of the base for activities that use an image showing percentages as hundredth. The whole square is considered to indicate one and all square one small square showing one percent. Students are directed to color the various sections that show for example, 15 percent, 28 percent, 65 percent, then directed to write it in different ways. For example for 15 percent can be written with 0.15 or 15/100 or 15%.

## RESEARCH PROCEDURES

This Classroom Action Research (CAR) was conducted at Elementary School N0.177657 Siabalabal, Sipahutar District, North Tapanuli. Subjects in this study were the students of 5<sup>th</sup> grade of Elementary School N0.177657 Siabalabal, Sipahutar District, and North Tapanuli Academic Year 2015/2016, while the object in this study was the activity and learning outcomes on active learning to study the ratio in the material of decimal. This research is a descriptive type research that describes the learning result and student activity level during learning. The steps taken in this study are as follows: (1) Preparation Stage, at this stage the author analyzed decimal material and percent in the 5<sup>th</sup> grade of Elementary School. Then create a lesson plan. (2) Implementation stage, before the learning is done, the previous day the writer told the students to bring scissors, cartons, ruler, plastic bags, printed paper / graphics, seeds, Grains, glue. Doing learning, learning process carried out like the following diagram:



Source: Pembelajaran Matematika SMP in LPTK, USAID PRIORITAS

(3) At the next meeting conducted tests to determine the level of mastery of students to the material that has been studied, (4) Data analysis is to know the level of mastery of students viewed from student learning outcomes, then the steps taken to analyze the test results data are as follows:

**a. Level of Mastery of Students**

According to Nurkancana (1986: 80), student mastery levels will be reflected in the high and low raw scores achieved and the conversion guidelines used are in the scale of the five absolute norms.

To determine the level of mastery of students used the formula as follows:

$$SMP = \frac{x}{N} \times 100\% \text{ where,}$$

SMP = Students Mastery Percentage,

x = Obtained Score,

N = Question Maximal Score

**b. Student Learning Completed**

Individual absorption, to determine the percentage of student absorption (PDS) individually used the following formula:

$$SAP = \frac{x}{N} \times 100\% \text{ where,}$$

SAP = Students Absorption Percentage,

x = Obtained Score,

N = Question Maximal Score,

With criteria:  $0\% < SAP < 65\%$ : Student is uncompleted in learning,  $65\% \leq SAP \leq 100\%$  : Students is completed in learning

Classical Absorption, to know the percentage of completed student in learning classically by using this following formula:

$$D = \frac{x}{N} \times 100\% \text{ where,}$$

D = the percentage of mastery classical learning,

x = the number of completed student,

N = total student

Based on the criteria of mastery learning, if in the class has been 85% that has reached the absorption of at least 65%, then the completeness of learning has been achieved classically.

**c. The completeness of Special Learning Objective (SLO)**

The completeness of each Special Learning Objective (SLO) is done by calculating the achievement of each item by the formula as follows:

$$T = \frac{Si}{S_{max}} \times 100\% \text{ where, } T = \text{the achievement of each question, } Si = \text{Number of students}$$

score for each question,  $S_{max}$  = Maximum number of scores for item. With criteria:  $0\% \leq T$



< 65%: SLO has not been completed,  $65\% \leq T \leq 100\%$ : SLO has been completed. The completeness criteria for SLO achievement are considered to be complete if at least 75% of all established SLOs have been achieved.

#### **d. Student Activity**

To obtain student activity data from an observation of student activities during the learning took place, observations were made on the dominant categories that emerged in the lesson and recorded on the observation sheet to determine the percentage of observational reliability used the following formula. The Percentage of Agreement (R) is the same as Agreements (A) divided (Disagreements (D) plus Agreements (A)) multiplied by one hundred percent.  $R = \frac{A}{D + A} \times 100$ . R = instrument reliability, A = number of match frequencies between two observers, D = number of unbalanced frequencies between two observers.....  $R \geq 90$ , very high agreement level (very similar observation equations);  $89 \leq R \leq 76$ , high agreement level (high observation similarity);  $75 \leq R \leq 60$ , medium agreement level (common observation similarity);  $R \leq 59$ , low agreement level (low observation similarity).

## **DISCUSSION AND RESULT OF RESEARCH**

### **Description of Research Results**

Based on the results of the calculation and data analysis of the results of research were obtained the following results: (1) the average score of learning results obtained by students is 25.21 with the average grade is 78.79 or with the percentage of mastery level of 78, 79%. It showed that the students' level of mastery is still classified as moderate; (2) Student's learning mastery: (a) individual absorption, the number students who complete the study was 26 students, while the unfinished study was 2 students; (B) Classical absorption, of the 28 students there were 26 students have completed the study or 92.31% of many subjects have completed learning, while the unfinished study was 2 students from 28 students or 7.69% of many subjects. This showed that classically the students' learning completeness has been reached; (3) Achievement of special learning objectives (SLO), achievement of specific learning objectives were all above 65.0%. Thus, learning has reached the thoroughness of SLO.

### **Student Activity**

From observation made by two observers to student activity during learning, it was found that students play an active role during learning, with the average level of student activity reliability on first learning was equal to 76, 92% and mean of level of student activity relation on second learning was equal to 84, 61 %, Thus an increase in student activity was occurred during learning.

## **CONCLUSIONS AND SUGGESTIONS**

The conclusion of this research are: (1) Student activity level at first learning is equal to 75,38 (active enough) with mean of student activity reliability level equal to 76,92% (medium), and student activity level on second learning equal to 86,15 (active ) With average level of student activity reliability equal to 84,61% (high), (2) active learning to study ratio in decimal material and percent in class V SD Negeri N0.177657 Siabalabal, Sipahutar of Tapanuli Utara in Year 2015/2016, Has been completed with the following details: (a) Students' level of classical control of 78.79% is moderate, (b) Absorption of individual students is obtained 26 people from 28 students or 92.31% of many subjects have completed

learning after completed classical achievement, (c) Achievement of specific learning objectives are all thoroughly achieved

Based on the above conclusions, the author suggests that teachers of Mathematics subject to using simple objects or props are also available around the school or environment. Teachers also have to familiarize students to be more active during the learning progress, so that students can find their own concept of the material being studied.

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