

# Active Learning with Experiment Whole Numbers in Fifth Grade of Elementary School

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**Keywords—** Active Learning,  
Experiment, Whole Numbers

**Abstract—** The purpose of this study was to determine the level of student activity and student learning outcomes in active learning by experimenting with whole numbers in fifth grade elementary school. The subjects in the study were fifth grade students of SD N 173189 Sosorpahu Kec. Sipahutar Taput for the academic year 2020/2021, while the objects of research were student activities and student learning outcomes as a result of active learning by experimenting with whole numbers. This type of research is descriptive research which aims to describe how student activities and learning outcomes achieved by students in active learning. by experimenting with whole numbers. The instruments used in this study were student activity observation sheets and student learning outcomes tests in the form of descriptions. The data taken are student activity data obtained from observations made by two observers, and student learning outcomes obtained from learning outcomes tests. From the analysis of the research data, it was found that: The level of student activity in the first learning was 75.71 (active) with an average level of student activity reliability of 82.62% (high), and the level of student activity in the second learning was 88.62 (active). with the average level of student activity reliability of 84.61% (high); Active learning with experiments on whole numbers in class V SD N 173189 Sosorpahu Kec. Sipahutar Taput Academic Year 2020/2021, the achievements have been completed with the following details: (a) The level of classical student mastery is 77.02% classified as moderate, (b) ) The absorption of individual students was obtained by 31 people from 29 students or 93.55% of many subjects had completed learning, meaning classically had been completed, (c) The achievement of specific learning objectives was completely achieved.

## I. INTRODUCTION

In the development of thought processes, children go through various cognitive levels. Although sometimes they think like adults, their reasoning is often very different, partly due to their lack of experience with the concepts being discussed. Therefore, it is the teacher's obligation to deliver lesson materials that are proportional to the level of student development. One way to minimize the difference between the two is to help students find their own ideas and methods needed to solve a problem.

So far, teachers, including writers, teach mathematics by providing definitions/concepts, then working on examples of questions followed by practice solving questions for students. Students are not trained to understand the concept and how the concept is obtained, while the expectations or what is desired from students are not only skilled at solving problems.

Successful teachers always stimulate their students to engage in a process and discover the rules for themselves, and then follow it up with a discussion. Competent teachers and learning theorists have realized the value and benefits of this principle. Students need time

to investigate and discover patterns and relationships. They have to make observations and organize those observations, then make assumptions and test them. The ability to make generalizations is at the core of the learning process.

The importance of students doing their own investigations becomes very clear when we realize that learning mathematics is an active participation and not like watching a sports match. The number of investigations and discoveries by students determines among other things: what they learn, how long they can retain what they have learned, the ability to apply it, the behavior that arises during the learning activity.

In terms of the learning process, teacher lecturing activities showed an increase, while teacher-student interaction, student activities in discussions, explorations, and investigations related to mathematical ideas, showed a decrease (World Bank Research, 2007-2011). Whereas such learning activities will train students in finding and thinking at a higher level in solving problems.

To learn mathematics, students need direct interaction with their environment. Direct interaction with the environment can develop students' sense of the field of mathematics. Interaction with the environment can also activate students in learning. The activeness of students in learning is important so that they understand mathematics well. The "real world", in mathematics learning is used to build mathematical concepts and as a place to apply them. Thus mathematics is not given in finished form, but mathematics as an activity. Mathematics is the study of patterns, relationships, and logical thinking, so learning mathematics should be an **ACTIVITY** to investigate and/or find patterns/relationships that at the same time trigger and hone logical thinking.

## II. REVIEW OF LITERATURE

### Cognitive Learning Theory

There are various theories that help develop students' understanding of mathematics, but generally these theories are not mutually exclusive even though each theory has certain characteristics that distinguish it from one another. Hatfield (1993: 38) suggests that broadly these learning theories are included in three groups of thoughts (ideas), namely cognitive groups, behavioral groups and information processing groups. One of the cognitive learners is constructivist theory. Constructivism was born from the ideas of Piaget and Vigotsky, both of which emphasized that cognitive change only occurs if previously understood conceptions are processed through an imbalance process in an effort to understand new

information. According to this theory, the most important principle in educational psychology is that teachers cannot simply impart knowledge to students. Students must build their own knowledge in their minds. Teachers can facilitate this process, by providing opportunities for students to discover for themselves and teaching students to consciously use their own strategies for learning. This is reinforced by Slavin (1994: 225) who likens that the teacher can give students a ladder that can help them reach a higher level of understanding, but efforts must be made so that students themselves climb the ladder. Piaget and Vigotsky (in Slavin, 1994: 49) also emphasize the social nature of learning, and suggest using study groups with different abilities of group members to seek conceptual change. Furthermore, Vygotsky emphasizes the socio-cultural nature of learning, students learn through interaction with adults and peers who are more capable. In groups of students, it is expected that the thinking process of their peers, this method not only makes learning outcomes for all students, but also makes the thinking processes of other students open to all students, namely that learning occurs when students work or learn about tasks that are not can be done alone and have not been studied in general but are still within the range of the ability of students or these tasks are in the zone of proximal development, namely the level of cognitive development is slightly above the level of cognitive development of the child. Furthermore, Vygotsky (in Slavin, 1994: 59) says that higher mental functions generally appear in conversation or collaboration between individuals, namely interactions with adults and peers who are more capable, before the higher mental functions are absorbed into the human body. the individual. Another important idea that can be drawn from Vygotsky's theory is scaffolding, namely providing a large amount of assistance to a student during the early stages of learning and then the student takes on increasing responsibility as soon as he can do it. Vygotsky's theory emphasizes that scaffolding is an important thing in modern constructivist thought. A recent interpretation of Vygotsky's ideas is that students should be given complex, difficult and realistic tasks and then provided with sufficient assistance to complete these tasks (rather than being taught bit by bit the components of a complex task which one day is expected to become a reality). an ability to complete the complex task). The help can be in the form of instructions, warnings, encouragement, describing the problem into solving steps, giving examples or anything else that allows students to grow on their own. Vygotsky's socio-cultural core in learning activities is placed as student interaction with the teacher (as an expert) through the concept of instructional scaffolding. According to Vygotsky learning

is a development of understanding. He distinguishes the existence of two meanings, namely the spontaneous and the scientific. Spontaneous understanding is an understanding that is obtained from the daily experiences of children. This definition is not defined.

While the scientific understanding is the understanding obtained from the class. This understanding is a formal understanding that is defined logically in a wider system. According to Fosnot (in Suparno, 1997: 45), in the learning process there is a development from a spontaneous understanding to a more scientific one. Constructivist philosophy assumes that knowledge is the result of human construction. Humans construct their knowledge through their interactions with objects, phenomena, experiences and their environment. A knowledge is considered true if it is useful for dealing with and solving appropriate problems or phenomena. Constructivists view that knowledge cannot be simply transferred from one person to another, but must be interpreted by each person himself. Knowledge is not something that has been made, but a process that develops continuously. In this process the activity of someone who wants to learn or who wants to know is very important in the development of his knowledge. In line with this, Millan and Driver, Pines and West, Driver and Bell (in Sutrisno, 1993: 2) essentially argue that the constructivist tradition views learning as an active process of a person in finding meaning about something around him that is meaningful for himself through his interactions. with the environment by forming a relationship between the knowledge already possessed and the phenomenon being studied.

Fosnot (in Suparno, 1997: 73) suggests a reference to a group of teachers using the principle of constructivism to develop teaching methods that emphasize student activity both in self-study and in group learning. Teachers look for ways to better understand what is thought and experienced in the learning process. They think of some activities and activities that can stimulate students' thinking. Interaction between students in the class is turned on, students are given the freedom to express their ideas and thoughts. Furthermore, Suparno stated that in mathematics education, the principles that are often used include the following:

1. Knowledge is built by students actively.
2. The pressure in the learning process lies on the students.
3. Teaching is helping students.
4. The teaching and learning process is more emphasized on the process, not on the final result.
5. The curriculum emphasizes student participation.

6. The teacher is a facilitator.

In line with cognitive development, Piaget's theory states that a person experiences a certain stage of cognitive development at a certain age period in his life. Each stage must be passed before one can improve in the next stage. Piaget divided the four stages of development of the human operating structure from birth to adulthood, namely the sensorimotor stage (0-2 years), preoperational stage (2-6 years), the concrete operations stage (6-12 years) and the formal operational stage (> 12 years). ). According to Piaget (in Suparno, 1997, 30) that the theory of knowledge is basically a theory of adaptation of the mind into a reality, as organisms adapt to their environment. It is also said that at the stage of formal operations, children have developed abstract thinking and logical reasoning for various problems. At this cognitive level, the child's schema continues to develop. Because a child's schema about a particular object may not be the same as an adult's schema. This inequality does not mean the child's schema is wrong, it's just that his understanding of the object is in accordance with the development of his thinking at that time. Suparno (1997: 34) explains that there is nothing "wrong" in a child's scheme, but perhaps it is "not suitable" for higher levels of thinking. Piaget (in Suparno, 1997: 35) also suggests that a person's cognitive development has three elements, namely content, function and structure. Basically Piaget explains that content is what a person knows, which can be observed from behavior that reveals intellectual activity.

### **Multi-Intelligence Learning Theory (Plural Intelligences)**

In general, each individual has intelligence (intelligences) that are different from one another. Likewise, students have different intelligences from each other. As stated by Susanto (2001) that: In reality that applies everywhere, humans are different from each other in various ways, including intelligence, talents, interests, personality, and social circumstances. However, the difference in intelligence is not an obstacle in solving problems, especially in the teaching and learning process in schools.

The theory of multiple intelligences is also known as the theory of multiple intelligences, multiple intelligences, and multiple intelligences. This theory contradicts the traditional learning theory of intelligence.

Jasmine (2007:232) suggests that: "IQ is believed to be quite stable throughout a person's life, whereas according to Gardner, the level of intelligence can change positively (increase) through teaching and awareness or turn negative (decrease) due to lack or not being used".

This means that a person's intelligence can develop optimally if it is honed and given the appropriate approach in ongoing learning and vice versa, intelligence will decrease if it is rarely or never used in learning.

Gardner (in Budiningsih, 2005:113) suggests that the main idea of the multi-intelligence theory is, humans have the ability to increase and strengthen intelligence, intelligence in addition to being able to change can also be taught to others, intelligence is a multiple reality that appears in different parts of the world. the system of the human brain or mind, at certain levels this intelligence is a unified whole. The same thing was stated by Anita Lie (2003: 9) that every child needs to get the opportunity to develop minimal intelligence in various dimensions (musical, gestures, visual, spatial, mathematical logic, linguistics, intrapersonal, natural spiritual, and existential). Thus, in learning that applies the theory of multi-intelligence learning, students play an active role in the classroom, with a note that teachers must pay attention that not all students have the same intelligence.

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

In today's learning what is expected is active students, students are directed to seek and find these concepts for themselves. In the learning process the teacher must create an atmosphere in such a way that students actively think, ask questions, question, express ideas, experiment, practice the concepts learned, and be creative. Learning is indeed an active process of students in building their knowledge, not a passive process that only accepts the teacher's lectures about knowledge. If learning does not provide opportunities for students to think actively, then the learning is contrary to the nature of learning.

A concept (eg addition, multiplication, flat shapes, etc.) which is explained through lectures is actually very difficult for students to understand because the concept is explained in an abstract way. Abstract things are difficult to understand because children's thinking level which tends to be concrete will be easier if stated/delivered in a real form. If in teaching the teacher uses media such as pictures, films, demonstrations and so on, the concepts learned become more concrete (real) and easier for students to understand.

However, the easiest way to make a concept concrete is when students are involved in direct and active experience in discovering for themselves from the experience a concept that is the goal of learning. For example, students find the meaning of addition after they engage in the activity of adding up using real objects (peanuts, pebbles, paper clips). The real experience and the

process of applying it provide a way for them to actively build their own understanding of the concept of addition.

Edgar Dale (1946; in USAID: 2013, 14) shows that the types of media or activities that can be used to teach a concept and its relationship to the level of concreteness of the concept that can be conveyed. Learning that relies only on verbal pads (lectures, reading) contains the highest level of abstraction, while direct experience that makes students actively discover and apply a concept has the highest level of concreteness. Edgar also argues by saying that "What I hear, I forget; What I see, I remember; What I do, I understand." This opinion was also added by Melvin, the author of 101 Ways of Active Learning which supports student activity to provide maximum learning outcomes by saying; "What I hear, I forget; 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 acquire knowledge and skills; What I teach others, I master." The active role of students is very important in the context of forming a creative generation, which is able to produce something for the benefit of themselves and others. Broadly speaking, the learning carried out in the classroom should describe the following:

- a. Students engage in various activities that develop their understanding and abilities with an emphasis on learning through doing.
- b. Teachers use various tools and various ways to stimulate students' enthusiasm for learning and help students build knowledge and understanding. These ways include using the environment as a learning resource to make learning interesting, fun, and suitable for students.
- c. The teacher organizes the class by displaying books and learning materials that are more interesting and provides a reading corner.
- d. Teachers apply more cooperative and interactive teaching, including group learning.
- e. The teacher encourages students to find their own way of solving a problem, to express their ideas, and to involve students in creating their school environment.
- f. The role of the teacher as a facilitator is not as a lecturer, meaning that the teacher designs active learning activities, during learning activities, the teacher no longer just stands in front of the class explaining the subject matter, but goes around monitoring student activities and helping students in the learning process.

### **Experiment for Students**

Mathematics lessons in the classroom at the same time function as a place and a procedure or method. It is



said to be a place because it is a space for students to take part in an experimental approach to mathematics, and it is said to be a procedure or method because in that space students learn, carry out and discuss experiments, collect and summarize data to find mathematical concepts. The space may just be students sitting on their own benches, or on the floor, or in the playground under a tree. Sometimes even a playground or excursion can become a laboratory.

Regardless of its physical form, learning mathematics in front of the class is the basis for an activity-oriented program, which helps achieve the goals of a mathematics curriculum that has been prepared/set. It is not intended as a substitute for regular classroom lessons, but simply as an effective way of teaching, designed to stimulate individual or small groups of students to carry out experiments in order to better understand what it takes to be able to work with symbols. Experiments are often carried out with concrete objects, either purchased or homemade or available in the environment. The teacher reads what must be done, or writes it on the blackboard, or on an assignment card and the tools to be used. In some experiments, students study a series of numbers, or geometric figures to find a pattern or examine and interpret the arrangement of objects, pictures, or symbols. On other occasions they may investigate ways of solving problems. So the teacher uses the laboratory as a way to accommodate the differences in students' abilities/intelligence.

The mathematics laboratory is only effective if it is included in the curriculum and used when experience in the laboratory is the best way to achieve the goal. Activities in the laboratory can serve to introduce a topic. For example, children who are just starting to learn triangles might group triangle models into triangles with all sides the same length, or one in which none of the sides are the same length. The laboratory is also an effective continuation of the discussion in class. Furthermore, topics can be repeated with laboratory experiments. Regardless of the framework of use, the laboratory experience is

designed to enhance the student's own discovery of concepts. While there is still much to learn about its use, the benefits are clear: many students progress from the excitement of discovering something, and become better at understanding the concepts being taught.

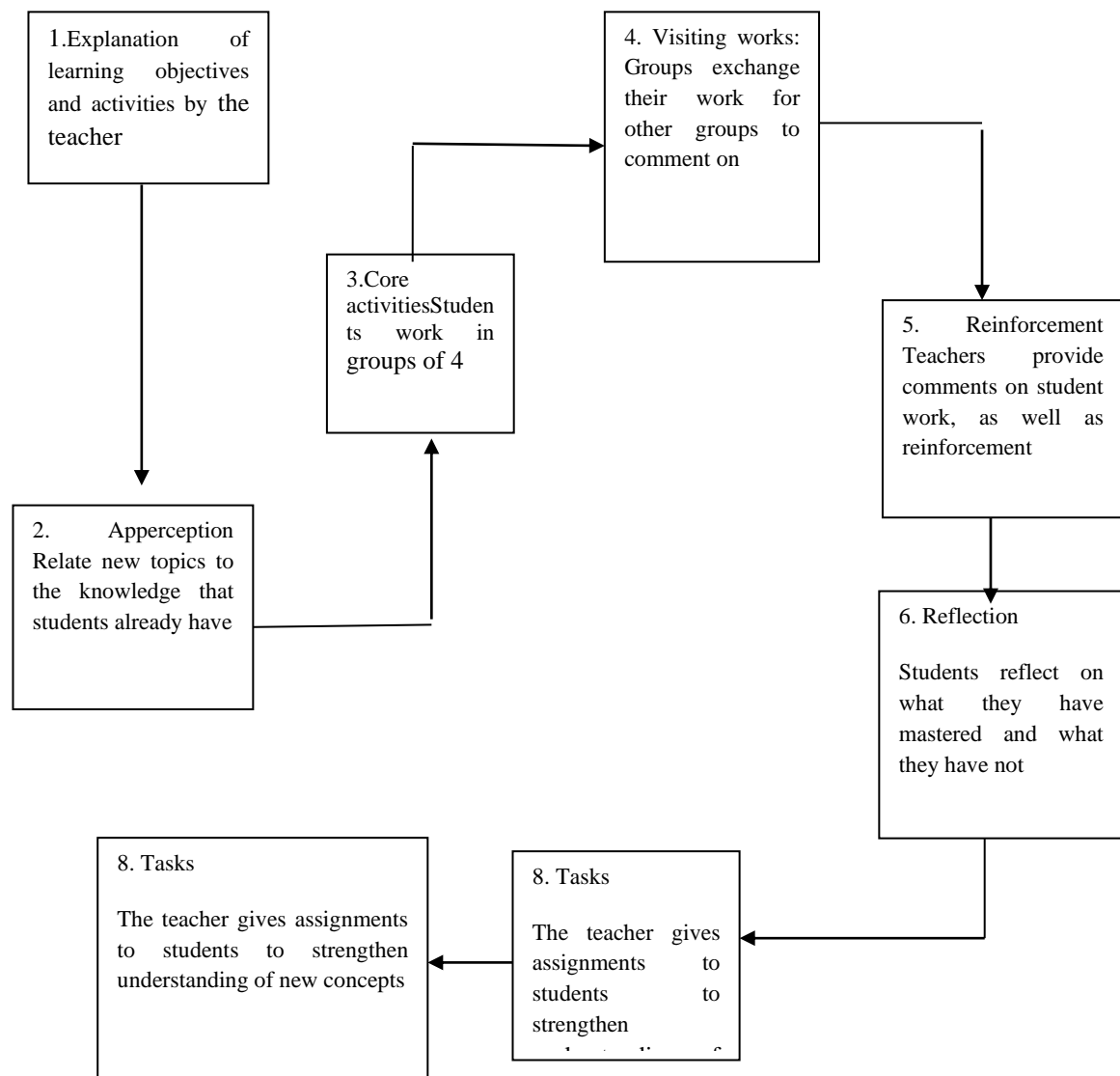
Introducing the mathematics laboratory, many problems arise if we want to start a mathematics laboratory. First, the teacher must be willing to try. This is a very difficult step because there are so many plans to be made and implemented; and for many teachers this is a step into the realm of ignorance. A suggestion if you want to carry out a mathematics laboratory is as follows.

Start gradually. Teachers can start experimental activities in the laboratory once a week. Of great importance is to study the math program for the week in question, determine what goals can best be achieved through the laboratory, and organize the activities for its implementation. Teachers can write their experiments on cards to share with students. If the collection of experiments more and more, the teacher can automatically choose.

Teachers can also outline laboratory activities for a particular topic. For example, the teacher wants to introduce the meaning of remainder in a division. Experiments on this subject can be planned, using existing tools to help students discover and understand these meanings.

### III. RESEARCH METHODOLOGY

This research was conducted at SD N 173189 Sosorpahu Kec. Sipahutar Taput. The subjects in this study were fifth grade students of SD N 173189 Sosorpahu Kec. Sipahutar Taput for the academic year 2020/2021. Meanwhile, the object of this research is the activity and learning outcomes of learning by experimenting on whole number material. This research is descriptive research that describes the actual state/outcome of learning.



Source: Middle School Mathematics Learning at LPTK, USAID PRIORITAS

#### IV. RESULTS AND DISCUSSION

Based on the results of calculations and data analysis of research results obtained the following results:

- a. The average score of learning outcomes obtained by students is 24.64 with an average grade of 77.02 or with a mastery level percentage of 77.02%. This shows that the level of mastery of students classically is still classified as moderate.
- b. Student learning completeness  
Individual absorption; the number of students who finished studying was 29 people, while those who had not finished studying were 4 people. Classical absorption; of 31 students there are 29 people who have finished studying or 93.55%, while those who have not finished studying are 4 people out of 31 people or 6.45%. This shows

that classically students' learning mastery has been achieved.

- c. Achievement of specific learning objectives (TPK)  
The achievement of specific learning objectives were all above 65.0%. Thus the learning has reached the completion of the TPK.
- d. Student activities  
From the results of observations made by two observers on student activities during learning, the results showed that students played an active role during learning, with the activity level in the first learning of 75.71 and the average level of student activity reliability of 82.62%; the level of student activity in the second learning is 88.82 and the average level of student activity reliability is 84.61%, thus there is an increase in student

activity during learning. From the description of the data analysis of the research results above, it illustrates that the level of student mastery in learning mathematics with "Active learning with experiments on whole numbers in class V SD N 173189 Sosorpahu Kec. Sipahutar Taput Academic Year 2020/2021" is moderate with the level of student mastery overall. classically of 77.02%, from 31 students there are 29 people or 93.55% of many subjects have completed learning, meaning classically learning has achieved complete learning. All TPK achievements are above 65%, which means that they have been completely achieved, the results of observations made indicate that students play an active role during learning.

Thus, that "Active learning with experiments on whole numbers in class V SD N 173189 Sosorpahu Kec. Sipahutar Taput Academic Year 2020/2021", the achievement has been completed.

## V. CONCLUSION

The conclusions of this study are: (1) The level of student activity in the first learning is 75.71 (active) with an average level of student activity reliability of 82.62% (high), and the level of student activity in the second learning is 88.62 (active). with an average level of student activity reliability of 84.61% (high), (2) Active learning with experiments on whole numbers in class V SD N 173189 Sosorpahu Kec. Sipahutar Taput Academic Year 2020/2021, the achievement has been completed.

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