

Jerome Bruner's Theory of Learning to Improve Basic School Students' Understanding of Numbers by Learning in Stage

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Abstract

Mathematics is a subject that is disliked by most students. This has resulted in a lot of children who are not enthusiastic about this lesson since elementary school. Elementary school is a place where children start knowing what numbers are, what numbers are and how a number looks. Numbers become the basis for children before learning about mathematics. There are so many branches in numbers that children need to know, starting from the basics of numbers, namely natural numbers, developing into whole numbers, whole numbers, and fractions. This is why the methods of learning mathematics must be well determined, at this time many learning methods have emerged with various criteria. Because of this, the writer tries to find the right theoretical solution according to the number material which has developing properties, the method that can be used is the Bruner Theory, which is to learn by understanding the basics first before proceeding with something that is more difficult because mathematics is an abstract concept.

Keywords: Jerome Bruner's Theory; Kinds of Numbers

INTRODUCTION

Elementary School (SD) is a level of education that is held to provide basic skills in reading, writing, arithmetic, knowledge and basic skills which are closely related to their application in everyday life. Various efforts and methods have been made to produce the best graduates so that they can continue to higher education. However, the results obtained are still far from expectations. According to data from the Central Statistics Agency (BPS) there were at least 20.450.382 workers who graduated from high school and equivalent as of February 2019. This can be based on many factors such as not having sufficient grades to continue to the next higher level.

The way students learn in class can affect student learning outcomes, when in the classroom when learning the method given by the teacher only provides concepts in abstract form, the teacher only provides examples of these concepts, and students are required to be able to work on problems as exemplified by the teacher (Hasil et al., 2010). This is what causes children to not be able to improve their thinking because they think that mathematics is only memorizing formulas, and will continue to find it difficult if they get questions that do not match the examples given.

A teacher is always faced with classroom conditions with students who have the ability to think, behave, and have various skills. The things that most influence students' thinking abilities are the learning methods used, the need for appropriate methods according to the characteristics of students, and students' environmental conditions so that they can easily understand the material that has been delivered. The learning model is very influential in the educational process to achieve educational goals through learning. However, there are a lot of difficulties experienced by students in learning in every subject. Because each student has different characteristics and different abilities in solving a problem. (Marogi et al., 2016).

In the field of education, mathematics plays a very important role in life in the future, because mathematics teaches students to think scientifically and foster abilities from what they know before. (Priatna & Yuliardi, 2019) However, many students have difficulty learning mathematics. One of the difficulties is the low ability of students because in general students prefer to memorize than practice and analysis. In fact, mathematics is a formula that students must understand to find out the meaning and purpose of the formula. However, most students only memorized the formula without knowing the meaning and purpose of the formula. Another problem regarding student learning outcomes, due to the lack of activeness of students which makes the class passive and has low abilities. (Rijal, 2016)

The ability to count is the ability to master mathematics which is considered very important and is closely related to its application in everyday life in society. Numbers or what is also called numbers cannot be separated from mathematics. Without realizing it, in everyday life you will definitely need numbers, for example when watching TV and wanting to change channels using the remote, you will see a row of numbers written on the remote. This is one example of the existence of numbers in everyday life.

The introduction of number symbols in children needs to be given as early as possible using the right way and according to the child's development stage. The introduction of symbols in mathematics plays a very important role in understanding mathematical concepts, because learning mathematics really requires number symbols until when you will use mathematics.

Learning mathematics may be a lesson that most students think that mathematics is difficult. The result is reduced interest and attention from students in learning mathematics. To overcome this, the teacher must introduce basic material that is easier, after the child understands the new basic material to continue deeper into the material. Because, anyone will feel difficult if they do not understand the basic material first. Likewise in elementary school, of course, before introducing addition, subtraction, multiplication, and division, teachers need to introduce numbers and numbers, the kinds of numbers that students must understand before learning mathematics.

Number is a mathematical concept that is used for enumeration and measurement as a form of depiction or abstracting the number of members of a set, and is a number that cannot be seen, written, read and said because it is an idea that can only be lived or thought about, so a symbol is needed. or a symbol used to

represent a number called a number or number symbol. Sudaryati (2006) states that numbers are used as a number symbol used to denote a number.

Number by number expresses two different concepts, number represents a quantity, while the number symbol (number) is the notation of the number. Numbers have many types, such as natural numbers, whole numbers, whole numbers, and fractions that must be mastered as a basis for learning mathematics. The ability to recognize number symbols in children is very important to develop in order to obtain readiness in participating in learning at a higher level, especially in mastering mathematical concepts. Understanding the concepts of mathematics regarding the kinds of numbers cannot be separated from the method given by the teacher to learn the kinds of numbers. One of the teachings that is oriented to planting basic concepts, then develops to find something new but still in one concept. With new discoveries, children can select, retain, and transform new information. So that it is hoped that students can understand a basic number, then can develop to recognize other numbers.

The way students learn numbers is by giving them the opportunity to metamathematise themselves with realistic problems, so they can construct or build their own knowledge. Giving problems to initiate learning so that students can try to solve problems in their own way, because most students are given information using mathematics that is ready to answer a problem. Students are given the freedom to think in solving a given problem, so that there will be many possibilities created by each student to solve the same problem.

Jerome Bruner's Theory Jerome Bruner's learning is also called discovery learning, which is student-centered learning to actively seek and find knowledge of the events he has experienced. By learning to seek knowledge actively by students, students automatically give results to themselves, and seek solutions to problems with their own efforts so as to produce truly meaningful knowledge. (Sutiadi, 2013) In carrying out a learning system, discovery has several advantages. This advantage makes a lot of people believe in the theory of discovery learning. This advantage is that knowledge can last a long time in memory, or it is easy to remember compared to knowledge learned in other ways, discovery learning has a higher success rate of student understanding compared to other learning outcomes, improves reasoning and has the ability to think freely. In an effort to solve problems, students learn to train cognitive skills in finding an invention without the help of others.

Bruner argues that "mathematics is a science that can be learned through the concepts and structures that already exist in mathematics, from these mathematical concepts and structures it can be searched for the relationships contained in the material" In improving education, especially education. mathematics, Bruner suggests 4 themes, namely the importance of knowledge structures, readiness to learn, emphasizing the value of intuition in the educational process, and motivation and desire to learn. This theory makes a person work to internalize events into a storage system according to the environment.

Bruner stated that the most important thing in learning is how people actively choose, retain, and transform information. This means that students can understand the importance of the structure of knowledge, because the structure of knowledge will help students to see how facts that seem unrelated, but in fact are

very related facts. Students not only receive information from the teacher, but students learn to find information from objects that are around them.

Bruner's approach to learning is based on the assumption that people construct knowledge by relating incoming information to previously stored information. Everyone when facing various problems in the environment will certainly form a structure or model that presents a grouping of certain things and connects with things we already know. With this, one can formulate hypotheses to incorporate new knowledge into our structures, by expanding those structures or building new structures can develop expectations that will occur.

The teaching application of Bruner's theory of discovery is viewed in terms of methods and objectives. Learning is not only about gaining knowledge by training students' intellectual abilities and stimulating their curiosity and motivating students' abilities. According to Bruner, learning involves three ongoing processes. The three processes are obtaining new information in the form of discovering something new, this new thing can be contrary to the information we previously stored, and there is also a refinement of previous information. Information transformation, making someone when they find something new will definitely transform new knowledge with the knowledge they already have. And testing the relevance and accuracy of knowledge can be done by assessing whether the way we have done with new information is in accordance with the information we expect.

Students will find mathematics difficult if the learning is not in accordance with the student's learning style. Because, students' different learning styles should be given the opportunity to find their own ideas, through their own ways with their own real life experiences.

This will be very useful for teachers to find good strategies for how children can learn by considering students' conditions. There are so many things that need to be paid attention to for the progress of education, attention can be in the form of development. First is the structure of knowledge, knowledge is needed by students to make it easier to understand material that does not seem to have a relationship between the information students already have. Second, readiness to learn, readiness is needed to learn in mastering skills. Third, the value of intuition in learning, intuition is needed for the conclusions of the learning that students have done while gathering information with the analysis step. And fourth, the motivation of the desire to learn, the desire of students to encourage students to participate actively in learning. (Buto, 2010)

RESEARCH METHOD

The method used is literature review related to Jerome Bruner's learning theory in fostering the ability to find new knowledge from the events he experienced. The data findings in this literature review are sourced from various related literatures. The primary source used in this literature review comes from references related to Jerome Bruner's Learning Theory, material on numbers, and problem solving from new discoveries that are obtained. Meanwhile, secondary sources used are learning activities and child psychologists.

RESULTS AND DISCUSSION

Learning in Bruner's Learning Theory

There are many efforts that can be made to improve mathematics learning, such as upgrading teachers, evaluating curriculum, having adequate teacher education qualifications, research on learning failures that are experienced, and selecting methods in learning that are suitable for students.

In this case Jerome Bruner states that students will build historically containing the conceptual structure of the ideas that exist in their minds. That's why students must be able to build and develop their thoughts about mathematics.

In the number material, students can learn the types of numbers starting from the simplest numbers, namely the original numbers that contain sets starting from number 1. If this number has been fully understood, then continue to understand other numbers. Because of the linkages in numbers, students can relate the information obtained to previously stored information. With this, students are able to develop what they know, develop knowledge about new facts that are related to each other.

Natural numbers are one of the simplest mathematical concepts of numbers and are among the first concepts and the first types of numbers that students can learn and understand.

Lesson 1: Natural numbers are numbers that start from the number 1 and continue with the addition of 1 from the previous number. With this, natural numbers can calculate the number of objects. With Situational activities, students can imitate and demonstrate the stories of hare and snails that compete with the aim of introducing students to the sequence and sequence of numbers where the position of the small and the snail starts a competition, with this students can understand the position of numbers.

Activity Model Of, an overview of mouse deer and snails to find out how students count and compare a lot of data through writing many different columns and rows. The arrangement of numbers can be initialized with a different color bead for every 5 numbers. This is to make it easier for students to compare numbers by observing the group of beads that are formed.

Formal activities that can be done is to write lots of mouse deer and snails with numbers. students are given random numbers of paper to hang in the right order. This activity has the aim of arranging and comparing numbers. In the position of Kancil and Snails doing a competition, students can observe a number sequence form, that is, when following the sequence of numbers the more to the right, the bigger it is. With this, students are able to be given a question to count the number of groups of snails. (Kampung et al., 2020)

The set of natural numbers can be applied to a symbol of the number of objects, with this the student is able to calculate the number of objects with a number symbol.

The set of natural numbers is:

$$\{1, 2, 3, 4, 5, 6, 7, 8, 9, \dots\}$$

Learning 2 : The obstacles experienced by students in learning numbers are they cannot write the symbols of numbers correctly, and they cannot read properly. good. So that the teacher must guide students in writing by giving examples of writing, which will then be followed by students. Here, students already have new thoughts and abilities about a number, students can save these thoughts and then continue to study other numbers according to the problems they will face.

Zero (0) is a number as a delimiter between positive and negative numbers. Zero is used to represent numbers in numbers in the form of numbers and numeric digits. In learning the meaning of a zero number, it is necessary to illustrate the data to make it easier for students to recognize zeros. (M.Primasti, 2019) For example, when students have ice cubes in molds and are stored in the refrigerator. Every day the students took the ice cubes from the mold. Over time the ice cubes will run out and not remain in the refrigerator. This is what can be said that the ice cubes in the refrigerator is 0 (zero). (Priatna & Yuliardi, 2019)

If students have learned about zeros, and have additional knowledge of information about zeros, then students have learned about counted numbers. Because, whole numbers are numbers that start from the number 0 and continue by adding the number 1 from the previous number. when studying whole numbers students can relate the information they get with the previous information. If the students have previously understood natural numbers, then students can connect whole numbers with natural numbers, so that students can find new information that the difference between the two types of numbers is the existence of a zero (0).

The set of whole numbers:

$$\{0, 1, 2, 3, 4, 5, 6, 7, 8, \dots\}$$

The relationship between natural numbers and whole numbers:

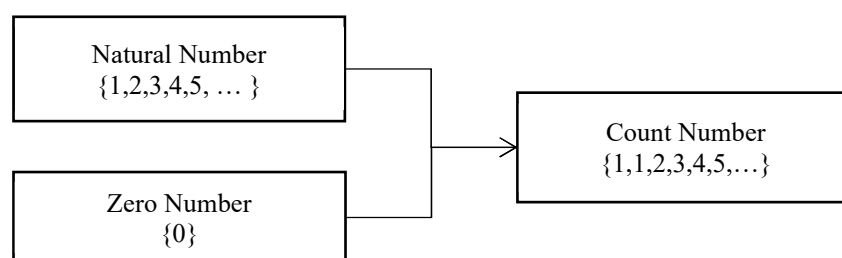


Figure 1. Natural Number and Count Number

Lesson 3: Every student who gets something they just got the teacher will definitely have difficulty conveying this material. As in the introduction of integers. The difficulty experienced by the teacher is finding a way to introduce for the first time to students what zero and negative integers are. Approaches that are still used today are to use a number line, use a number back and forth, and use an initialization, namely debt. However, in this way it is not yet able to make children understand

the meaning of zero and negative integers, due to an abstract nature of the material and not in accordance with concrete students' thoughts.

The way that can be done to make it easier for students to learn zeros and negative integers is to find an imitation of a real situation and can make it easier for students to imagine an event. An example that can be illustrated is a water transportation, namely a ship with a position at sea level, which is expressed on a vertical number line. Through the depiction of an integer zero right at sea level, if it rises one unit above the water level it will show a positive number of one, if it rises two units above sea level it shows a positive number two, and so on. (Marogi et al., 2016)

Likewise, if it falls one unit below sea level it will show a negative number of one, if it drops two units below sea level then it is negative two, and so on.

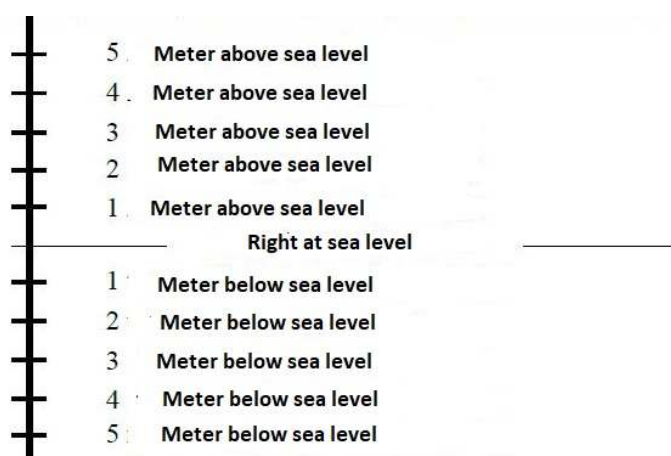


Figure 2. Surface and Seabed

After understanding the concept of integers on a vertical line, students then learn to change the vertical number line to horizontal. The position of the changed number that was originally on the upper side of zero, now changes to the right side of zero. Likewise, the position of the number which was initially below zero, becomes the number on the left side of zero.

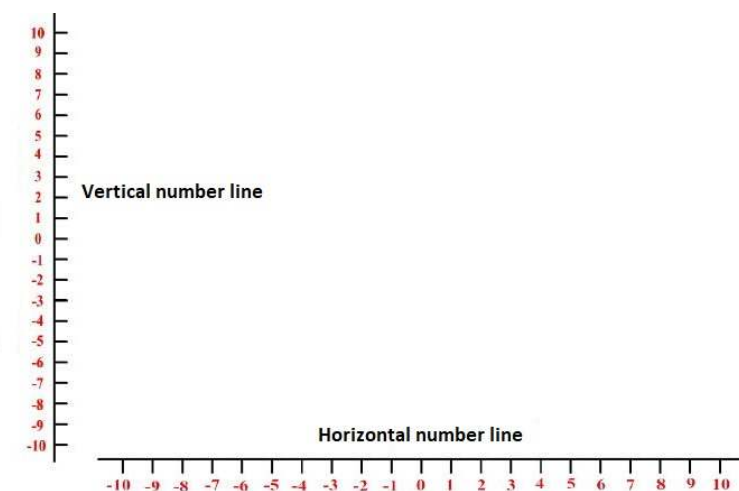


Figure 3. Vertical Lines and Horizontal Lines

Lesson 4: All student activities when studying must have an outcome that belongs to the student in the form of mastery / understanding level. Meanwhile, the results of students' mathematics learning activities were obtained daily tests. After students understand all the material being taught, it is hoped that students will be able to do the questions correctly and correctly.

The learning model that can be done is with a game that is carried out in class, namely making number lines on cardboard and students can sort numbers by completing number lines where some numbers have been written on the number line. Another learning activity is by group learning, with group learning to help students complete assignments in a way that students who have high abilities can help students who have moderate and low abilities. The purpose of group work is to give opinions to others about critical and logical thinking, to learn actively, and to help other students to understand material that has not been understood. (Nurisa, 2018)

Problems Math

1. $3 - 5 = \dots$
2. $1 - 4 = \dots$
3. $-3 + 6 = \dots$

How do you find the sum of the subtractions?

The work of the questions is done after the students understand what an integer is. Integer has a relationship with the previous number. An integer is a number consisting of whole and negative numbers which can be written without a decimal or fraction component. If students do not understand what a whole number is, and immediately learn about integers, it will definitely confuse students. Because, integers have to do with whole numbers.

After understanding the material obtained, students can determine the method that is suitable and suitable for each of them. In Bruner's Theory, something material will be easier to understand if the material exists in a real form, such as the game method.

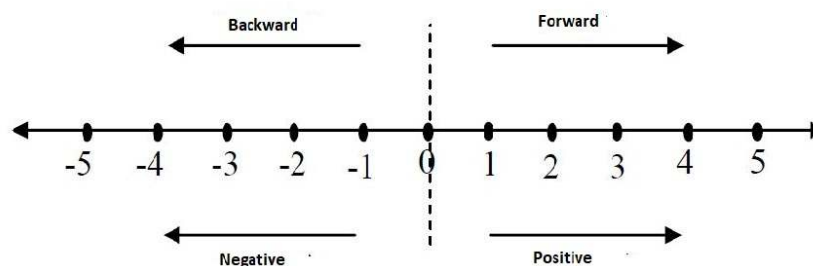


Figure 4. Positive and Negative Direction Figure

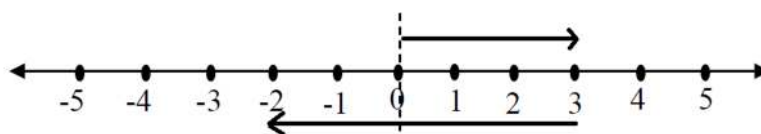
The introduction of integers to students is indeed a difficult thing, this recognition can be done with an activity or event around us that can illustrate a positive integer and a negative integer, so that students can understand the concept in real form, for example:

1. If walking towards the north is called a positive direction, then walking towards the south is called a negative direction.
2. If doing good is defined as positive action, then doing bad is defined as negative action.
3. Debt is defined as a negative number, for example a debt of 100 rupiah is the same as having -100 rupiah in cash.

In the problems faced by students, there will definitely be many ways out of the 1 existing problem. Problem solving becomes a press when students are faced with a problem until the problem can be resolved. In the process of solving the problem, there are 3 phases that exist, namely reading and understanding the existing problem, compiling the right solution to the problem, and confirming an answer that has been obtained and the process that has been done. (Tambychik et al., 2010)

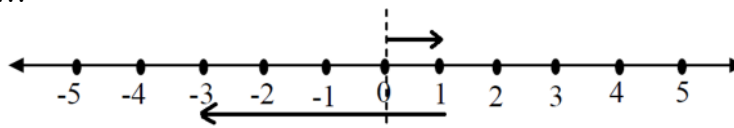
How to answer the question:

1. $3 - 5 = \dots$



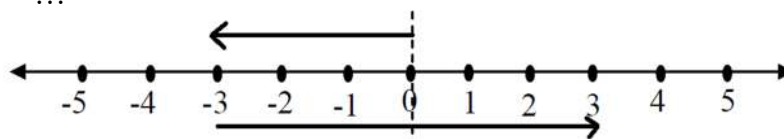
Positive direction to the right shows an arrow up to number 3, in subtraction the arrow will point 5 digits to the left until it passes zero and meets the number -2.

2. $1 - 4 = \dots$



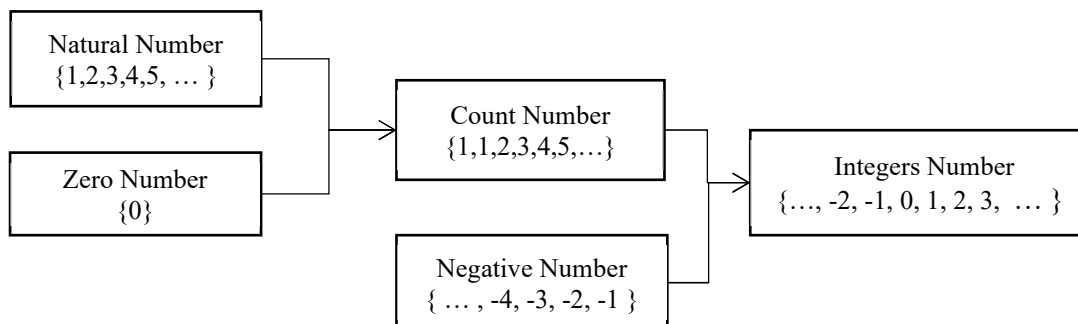
Positive direction to the right in number 1, in subtraction the arrow will point 4 to the left until it passes 0 and ends at -3.

3. $-3 + 6 = \dots$



The number -3 points to the left as a negative number, the addition will point to the right, so that 6 digits to the right are in number 3. If the

student already has facts about the group of numbers, and learns integers, then the student will relate the information he got. previous. It turns out that integers have a relationship with the previous numbers, it can be seen from the differences



seen in the previous group.

Gambar 5. Natural Number, Count Number and Integers Number

The difficulties that students often experience in learning about integers are numbers that contain a negative sign, students' understanding of problems in the form of mathematical sentences, difficulty understanding equals and parentheses as symbols of number operations, and difficulty in division operations. (Sidik & Wakih, 2006)

The ability to think in mathematics is an important thing. Learning will continue to develop if students are late in learning and there is always an active data management process by carrying out discovery activities to get new information based on previous knowledge. With this, students are able to make decisions based on themselves through selecting and changing information. (Evi, 2011)

The stages in learning something should be learning starting from understanding basic concepts. Like numbers, before studying mathematics with other materials, it is better to learn about numbers. If students do not understand what numbers are and their operations, students will definitely feel confused.

The ability of students to understand numbers can be seen from the ability of students to determine the correct number operations with reasons and how to solve problems given by the teacher. Understand problems by connecting actual calculations with problems of everyday life. And always have a high level of accuracy after getting the data results. (Safitri et al., 2017)

In learning mathematics not only can be understood through numbers, numbers are an abstract thing, so an act of interacting with the environment is given through the exploration and manipulation of objects, conducting an experiment regarding a number of questions, and preparing a flash. required in learning. (Andi Yunarni Yusri & Sadriwanti Arifin, 2018)

Students will learn from the ideas they already have so they can construct with new ideas. So that it can connect existing ideas with new ideas, so that the many concepts you have will have better understanding and will create new ideas in the thinking process.

Understanding will not always produce a developing form because it depends on creating a relationship between new ideas and existing ideas with precise and meaningful procedures. In this case understanding is divided into 2 types, namely (1) Instrumental, understanding mathematics without understanding what the initial concept of mathematics is, so that students can only work without knowing the origin of a concept. (2) Relational, having a real concept, understanding a concept, and doing it efficiently and understanding what to do. (Zuliana et al., 2019)

CONCLUSION

The ability of students to be active in learning is very necessary, using Jerome Bruner's learning model which assumes that learning is how people choose, retain, and transform new information. So that with this students will be more active in thinking and easier to understand the problems at hand, students will find new ideas through *pengelama*, and then be able to combine them with old ideas and produce an extraordinary idea. Likewise with numbers, which can develop into new knowledge.

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