AN OVERVIEW OF THIRD GRADE STUDENTS' UNDERSTANDING OF THE CONCEPT OF FRACTIONS

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ABSTRACT

Fraction material is a complex study that makes it difficult for students to understand the concept. The concept of fractions is different from natural numbers and whole numbers because it has its own uniqueness that creates pedagogical challenges for the mathematics education community. The purpose of this study was to determine the understanding of third grade elementary school students regarding the concept of fractions based on Bruner's theory. This research used qualitative method with descriptive approach. The research subjects were third grade elementary school students in North Toraja Regency. In Bruner's theory, the understanding process starts from the enactive stage to the iconic then to the symbolic, but based on the findings in this study conducted to several elementary school students in North Toraja Regency, different results were found, namely the understanding process starts from the iconic to the symbolic, without passing the first stage, namely enactive. Students find it too difficult to understand the enactive stage because the concepts taught at school immediately start with the image media so that is what causes the loss of this stage. Therefore, it is expected for teachers to teach concepts starting from the enactive stage because at this stage students understand more easily by using concrete objects related to everyday life.

Keywords: fractions, concept understanding, Bruner's theory

ABSTRAK

Materi pecahan merupakan kajian yang kompleks sehingga membuat siswa kesulitan memahami konsep. Konsep pecahan berbeda dengan bilangan asli dan bilangan bulat karena memiliki keunikan tersendiri yang menciptakan tantangan pedagogis bagi komunitas pendidikan matematika. Tujuan penelitian ini adalah untuk mengetahui gambaran pemahaman siswa SD kelas III mengenai konsep bilangan pecahan berdasarkan teori Bruner. Penelitian ini menggunakan metode kualitatif dengan pendekatan deskriptif. Subjek penelitian adalah siswa SD kelas III se-Kabupaten Toraja Utara. Pada teori Bruner, proses pemahan dimulai dari tahap enaktif ke ikonik kemudian ke simbolik, namun berdasarkan hasil temuan pada penelitian ini yang dilakukan ke beberapa siswa SD yang sekolah di Kabupaten Toraja Utara, ditemukan hasil yang berbeda yaitu proses pemahamannya dimulai dari ikonik ke simbolik, tanpa melewati tahap pertama yaitu enaktif. Siswa terlalu sulit memahami tahap enaktif dikarenakan konsep yang diajarkan di sekolah langsung dimulai dengan media gambar sehingga itulah yang menyebabkan hilangnya satu tahap ini. Oleh karena itu, diharapkan bagi guru untuk mengajarkan konsep dimulai dari tahap enaktif karena pada tahap ini siswa lebih mudah memahami dengan menggunakan benda-benda konkret yang berhubungan dengan kehidupan sehari-hari.

Kata kunci: pecahan, pemahaman konsep, teori Bruner

1. INTRODUCTION

In mathematics education, every student is expected to possess mathematical ability, which must be developed to improve learning achievement and cultivate their mindset. In mathematics education, every student is expected to possess mathematical ability, which must be developed to improve learning achievement and cultivate their mindset. It is important to maintain objectivity by excluding any subjective evaluations unless clearly marked as

such, while adhering to conventional academic structure, clear and concise language, and formal register. Understanding the relationships and interconnections between the internal representations of mathematical objects in the representation network is crucial to forming meaningful and communicable external representations. Additionally, employing precise and technical vocabulary and grammatically correct language is essential. Finally, citation and footnote formatting features must be consistently employed, and the text should avoid biased language and maintain a logical and balanced structure. The range of strategies utilized in math representation include: (1) Tables, graphs, and images for visual presentations; (2) Symbols and mathematical statements; and (3) Formal and informal written text in the language of the writer [1], [2].

To enable students to comprehend the material under study better, media aids must be employed to foster direct engagement between learners and the subject matter, therefore allowing for the creation of personal insights by the students [3], [4]. In addition, [5] posit that interventions aimed at enhancing the mathematical literacy among students should be implemented while also providing teaching aids. Innovative learning approaches demand that both educators and students utilize creative thinking to adjust to the changing times. These approaches aim to produce students who embody qualities such as being active, innovative, and cultivating a noble character [5], [6].

Concept understanding is an important foundation for thinking in solving mathematical problems and problems in everyday life. Developing concept understanding ability is one of the goals in the curriculum, this ability is very supportive of other mathematical abilities, namely communication, reasoning, connection, representation, and problem solving. The process of representation translation can occur in the thinking process to understand an idea or concept. This translation is necessary because of the need to accommodate the structure of information in order to obtain mental balance (equilibrium). Translations or shifts in the representation of ideas can lead to maturity of thinking or increased levels of thinking. One of the cognitive theories about the level of thinking is the theory of meaningfull learning by Bruner [7], [8], namely connecting or linking information to concepts in the cognitive structure of enactive, iconic, symbolic levels [9]. In the development of thinking, students will experience enactive, iconic and symbolic phases and in the process students will experience translations in representing ideas/concepts that are thought or solved. The characteristics of each thinking translation experienced by students are interesting information in cognitive psychology theory to underlie the need for the design of knowledge transfer strategies in learning.

One of the math concepts that is the focus of research today is fractions. The 2013 curriculum for elementary schools states that the scope of mathematics subjects includes numbers, geometry, measurement, and data processing. Based on the curriculum, fraction material is part of numbers. Furthermore, the material of fractions and their operations is one of the teaching materials that is very important to learn further mathematics and is often used in everyday life [10].

In improving concept understanding, educators need preparation in delivering the material. Efforts are made in the form of selecting the right teaching materials in which students are directly and actively involved so as to increase understanding of concepts and achieve learning objectives. [11] argues that mathematics subjects emphasize the concept of understanding.

A deeper knowledge of the formation of a concept is very important. [12] say that these misconceptions come from teachers who are in a hurry and do not give enough time to develop basic concepts to students. What is really needed in learning fractions is not just that children can perform operating procedures on fractions but rather a variety of examples/models of the fractions being taught, or what is called a physical model [12], [13]. Without physical models, students may be skilled in doing procedural problems such as: fraction similarity, fraction operations, converting fractions from ordinary, mixed fractions into decimal fractions, percentages, or vice versa but what if they are faced with fraction modeling problems, this skill is not guaranteed to be mastered without learning that utilizes many physical models. This physical model will help students construct their mental schema about fractions. For example, students are faced with numerical fractions 1/2, 2/3 and others, these numbers are abstract representations of certain physical buildings, students must have a lot of primary experience with the physical models of these fractions so that the numerical representations become meaningful. And teachers should not rush to the next topic before the basic concepts are well understood.

Teaching fractions is not only about transferring mathematical ideas, methods and concepts, but it is rather a way to define fractions as a process of origin, occurrence and (gradual) development. It starts by connecting a math topic with real life, known as the contextual approach. Students construct their own mathematical concepts.

One of the materials in mathematics that must be understood is fractions. The discussion of the material focuses on working on basic arithmetic operations, namely addition, subtraction, multiplication, and division, both for ordinary fractions, mixed fractions and decimal numbers. Fractions play a central role in learning mathematics [14]. Interestingly, the concept of fractions is not a simple concept but has its own uniqueness that is different from natural numbers and whole numbers. However, the concept of fractions is considered as a difficult-to-learn and difficult-to-teach concept thus creating ongoing pedagogical challenges among the mathematics education community [15]. Fractions are a very difficult and complex mathematical material that students find very difficult to understand.

One of the solutions that can be applied to minimize student errors in understanding the concept of fractions is to provide explanations using concrete props. Therefore, through this research, it is expected that in understanding the concept of fractions, students start with real objects then they are guided to obtain something abstract, namely the concept of fractions. First, students are invited to manipulate representatives (representations) of fractions in the form

of real/concrete objects (enactive). The representation of a concept is called the representation of the concept. Then the activity is expressed with pictures (iconic). Finally, students express the concept with representatives in the form of mathematical symbols or notations (symbolic). From these three activities, students are expected to obtain the concept of fractions. The use of inappropriate representatives or representations can result in students not being able to understand a concept. In addition, the transition between these representations can also cause students to lose the meaning of the concept itself. The process of moving from the iconic to the symbolic level needs attention in the formation of mathematical concepts. If not careful, then this process will become meaningless because symbols have abstract properties and are empty of meaning [16]. According to the principle of notation, the achievement of a concept and the use of mathematical symbols must be gradual, from cognitively simple for students to understand and then slowly increase to more complex. Bruner emphasizes that each student experiences and recognizes real events or objects around his environment, then finds by himself to represent these events or objects in his mind. This is often known as a mental model of the events experienced or objects observed and recognized by students.

From the results of observations and interviews with several teachers in North Toraja Regency conducted by researchers in class III, researchers found the problem that the results of students' concept understanding of fractions were still low. So that researchers are interested in conducting research in finding what causes the low understanding of the concepts of students. The purpose of this study is to provide an overview of the understanding of the concept of fractions in grade III elementary school students.

2. METHOD

This study adopts a qualitative research methodology with a descriptive approach. According to [17], a qualitative approach involves the collection of written or spoken words or behaviors from individuals that can be observed. Additionally, [18], [19] asserts that qualitative research examines social phenomena and human problems.

The research was conducted in Toraja. The study employed main and supporting instruments in the form of tests and interview guidelines to investigate third-grade elementary school students in North Toraja Regency, South Sulawesi Province. The study employed main and supporting instruments in the form of tests and interview guidelines to investigate third-grade elementary school students in North Toraja Regency, South Sulawesi Province. Technical term abbreviations were explained upon first use, and a logical flow of information was maintained throughout the text. The language used was formal, unbiased, and value-neutral, employing consistent technical terms where appropriate. Standard language was used throughout the text, and passive tone and impersonal constructions were utilized. The text adhered to proper style guides and citation formatting, and quotes were clearly marked and filler words were avoided. Grammatical correctness was ensured throughout the text.

3. RESULTS AND DISCUSSION

The stages carried out in this research are based on Bruner's view, namely enactive, iconic and symbolic. In this study, students were confronted with several objects available on the table as in the picture below:

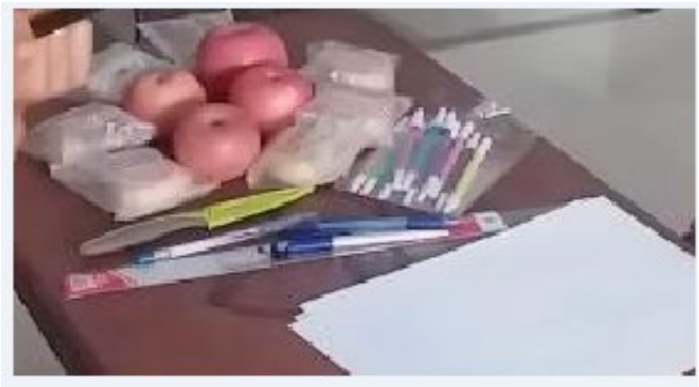
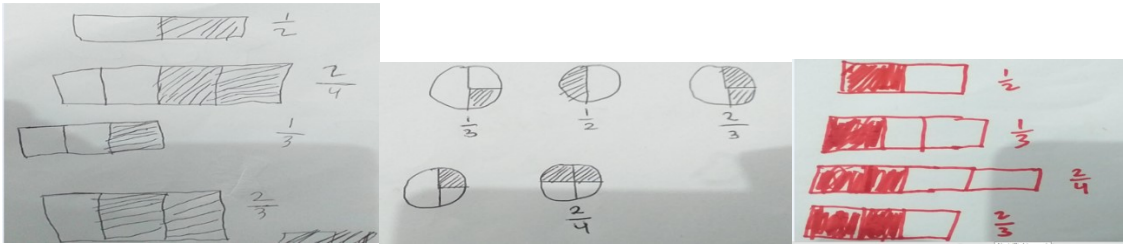


Figure 1. Materials and tools used to represent fractions

From the objects available on the table, each student is invited to explain:
1. What do you know about fractions 1/2, 1/3, 2/3, 2/4 using the available materials and equipment?
2. Try writing down the symbols for the fractional numbers you have drawn!
3. What is a fraction?

The students' answers to the questions above are:



(a) (b) (c)

Figure 2. Results of student answers

On the students' answer sheets, it can be seen that they started working on the questions given from the iconic stage by immediately drawing and shading according to the shape of the fraction being asked, then writing the symbol of the fraction next to the picture. Based on Bruner's theory, understanding fractions should start from the enactive stage to the iconic stage and then to the symbolic stage because these stages are very important for students who must find order by first manipulating the material they already have, so that in learning students must mentally active, which can be seen from his physical activity.

From the results of interviews with students, it is known that students start at the iconic stage based on the understanding gained during learning at school, namely the teacher explains fractions through pictures and shading so that students do not understand the enactive stage. This shows that teachers do not utilize the existence of concrete objects as a medium in learning. The existence of concrete objects actually really helps teachers in explaining teaching material. Concrete objects can help students understand abstract concepts to become more concrete according to their stage of development. This is in accordance with what was stated by [20], [21] regarding one of the characteristics of children aged 9-12 years (grades 3-4) is that they are happy and can use tools and small objects. . So based on this opinion, the existence of concrete objects in learning is a worthy thing to do. Concrete objects also motivate students to learn, because at their age they still like to play, concrete objects in learning make students be in an event that they have experienced so that learning takes place in a fun way.

In theory, students understand that fractions are parts of the same whole. However, the pictures made by the students showed different results because the pictures they made were actually not the same size. This is shown by the way students make drawings without using the ruler provided so that the sizes of the shapes they make are not the same size and the parts that are drawn are also not the same size. This shows that students are able to solve problems that seem to be correct but are not completely correct in understanding the concept. So it is very necessary to have concrete objects which are one part of Bruner's Theory which is very important in learning in order to form an understanding of concepts, so teachers should be able to present concrete objects as learning media. Apart from that, the teacher's accuracy in choosing concrete objects must also be considered so that there are no misconceptions in learning.

4. CONCLUSION

From this research it can be concluded that the process of understanding the concept of fractions in students throughout Toraja Regency is different from Bruner's theory, namely the understanding process starts from the enactive stage to the iconic then to the symbolic, but starts from the iconic stage then to the symbolic stage without going through the enactive stage. This is what makes students misunderstand the concept of fractions which are parts of a whole that are divided equally.

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