UNDERSTANDING THE COHERENCE OF FRACTIONS FOR PRIMARY SCHOOL TEACHER

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Abstract

In essence, mathematics is a science that is hierarchically structured, systematic and logical so that in learning, coherence of teaching material is something that must be considered. If the concepts presented are not coherent, it is likely that students can have difficulty in learning mathematics. This happens because the material being studied entirely new, students have no prior knowledge of the material, so there is no association in cognitive scheme. That is, students are not learning meaningfully. One of the main materials that are often considered difficult in primary schools is fraction, of course in addition to the coherence of material there are many factors that cause the problem. The analysis was conducted on the material fractions contained in the Curriculum 2013 in Indonesia related coherence of teaching material and barriers to learning (learning obstacle) common to students during learning fractions. It is important to know both the teachers and prospective teachers to be able to create the optimal learning to develop students' mathematical abilities.

Keywords: fraction, learning obstacle, material coherence.

INTRODUCTION

Mathematics is a structured science, organized from undefined elements, undefined elements, axioms or postulates, and propositions that have been deductively proven. The implication, the concept of mathematics is composed of a simple to complex things, so that in learning arise prerequisite materials. The prerequisite material becomes the basis of initial knowledge in learning the next material. As we know, Piaget in his theory of individual constructivist views the early schemata of students is very important in building knowledge, where the process of assimilation and accommodation to obtain a new knowledge. In addition, Ruseffendi (2006) argues that the essence of mathematics as a systematic, logical, and hierarchical science implies the facts, skills, concepts, and rules that exist in mathematics must be taught sequentially. This applies also to any mathematics material in primary school, which must be submitted and taught sequentially.

In the Curriculum 2013 the scope of mathematics materials in primary schools consists of numbers, geometry, and statistics. Fractions are part of the number matter that must be taught sequentially as characteristic of mathematical objects. Fractional material in primary school has a substantial proportion. This can be seen from the fractional materials that began to be taught since the second grade of elementary school, where in every level of class there is fractional material. The importance of fractional materials controlled by students sees that, in everyday life as well as academic fields related to mathematical material, many involve fractions. For example, when learning about the wide area of a lot of formulas involving fractions, even irrational numbers in the form of fractions as the formula of the area of the circle.

Various fractional materials and substantial proportions in elementary school, does not necessarily make students become trained and proficient in fractional materials. Conversely,
the fractional material becomes one of the mathematical parts of the material deemed difficult by the students. According to Khairunnisak, Maghfirrotun, Juniati, & De Haan (2012) students have difficulty understanding the meaning of fractional multiplication. While Julie, Suwarsono, & Juniati (2013) mentioned that one of the hard mathematics materials for fifth graders is a fraction.

The difficulties faced by students in studying the fractional materials one of them is caused by the existence of the fraction of the material fractions. This is where the role of teachers as curriculum developers to be able to map and analyze the material, so that what is taught in accordance with the level of knowledge of students and based on the initial knowledge of students. Referring to Mulyasa (2008), one of the four competencies of teachers is professional competence, professional competence is one of them is to sort learning materials in various ways include: 1) chronological sequence; 2) a causal sequence; 3) structural sequences; 4) logical and psychological sequences; 5) spiral sequence; 6) backward circuit; and 7) sequences based on the learning hierarchy. Material demands provide individual connections for students, so learning new material becomes easier. As stated May (2011) that the new knowledge will be more easily understood students, if there is a connection with the knowledge already owned. In other words, that the connection between the initial knowledge and the new knowledge is the inter-material demands, as well as the fractional material.

Fractional material contained in the Curriculum 2013, there are some that are not coherent, between the material that has been studied with new material to be learned. If this unattended material is submitted directly to the student without prior analysis by the teacher, it will lead to student learning barriers. Therefore, this study discusses the fraction of fractional materials in primary schools that are important for teachers to understand.

METHODOLOGY
The methodology used is literature review. The analysis was conducted in various Curriculum 2013 documents to view the fractional material demands, such as in teachers 'and students' books, as well as the 2016 revised edition of the curriculum syllabus. The findings of material disputes were analyzed supported by various sources.

DISSCUCION
Sequence of Fraction Materials on Curriculum 2013
The scope of mathematics learning materials in primary school consists of three discussions, namely numbers, geometry, and statistics. Fractional material is included in the number material contained in the second to the sixth grade curriculum. Here is the sequence of fractional materials contained in the 2013 curriculum.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Fraction Material</th>
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<tbody>
<tr>
<td>II</td>
<td>Simple fraction $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$</td>
</tr>
<tr>
<td>III</td>
<td>Explain and use the presentation of a valid whole number and simple fractions such as $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ on the number line. Generalize the idea of fractions as part of the whole. Arithmetic operations of addition and subtraction in the same denominator fractions.</td>
</tr>
<tr>
<td>IV</td>
<td>Equivalent fractions. Various forms of fractions (fraction, mix number, decimals, percents, and the relationship between the forms of fractions).</td>
</tr>
</tbody>
</table>
Incoherence Fraction Material in Curriculum 2013

Fractional materials in elementary school are taught gradually from second to sixth grade. Fractional material, in the delivery there are some materials that are not conveyed coherently. Based on the findings and analysis, some of the fractional material discrepancies in elementary schools will be explained in the following points.

1. The order of introduction of simple fractions in second grade is that, introduction of the fragments is not ordered if it is based on the student’s ability. In this case because fractions simpler and more easily introduced to the students after fraction. Where as it is known, is twice.

2. In third grade, there is a material about the assessment of the results of the operation of two fractions, this material already has the right sequence because it is taught prior to addition operation and reduction of fractions. Only if in the beginning the students are not used to assess the value of a fraction, the students will have difficulty in assessing the operating results of the two fractions. So it is best to know the concept of fractions as part of the whole, students need to be trained to assess. Van de Walle, Karp, and Bay-Williams (2013) states that it is important to hone number sense, it requires students’ intuition to estimate fractions. Students need to know the value of fractions and can easily compare the value of two fractions.

3. In the fractional material worth in fourth grade it would be nice if introduced also with the concept of namesake fractional, fractions that have same denominations. This material, as noted by Van de Walle (2013) was delivered in conjunction with equivalent fractions material. This is to facilitate students in determining the value or comparing the value of two fractions.

4. In fifth grade, students learn about comparison and scale. This material is taught after multiplication and division of fractions material, and there before the mixed operation material. Comparisons have connection with fractions in terms of writing, but not the same as comparison material fractions.

5. The material of the operation of the various fractional forms was introduced in fourth grade, this is not coherent because it is explained after the comparative material and scale. This material should be taught after the multiplication and distribution of the material because of the addition, subtraction, multiplication, and fractional operations material is an needed knowledge in studying the material of the mixed operation of various fractional forms.

6. In fourth grade, students also studied mixed count operations on fractions and number. Such learning should be at the beginning of each fractional operations learning because students have early knowledge of number operations. Example:

1. In addition operation:
1. The concept of Fraction as a Number

Cramer & Whitney (in Van de Walle, Karp, & Bay-Williams, 2013) states that students find it difficult to view fractions as a whole. The student considers the numerator and denominator as separate numbers because of the way the writing is different from other numbers. Difficulties experienced by students tend to make them make mistakes, both in understanding the concept of fractions and in the operation of fractions.

Difficulties like this can happen if students directly introduce to the symbol of writing a fraction without understanding the meaning of the symbol. In introducing the concept of fractions, teachers should introduce the meaning of fractions using concrete objects first before introducing the fraction symbol.

The use of concrete objects is also in accordance with the theory of mental development proposed by Piaget (Ruseffendi, 2006), which states that learners who are aged 7-12 years are at a concrete operational stage. Students at that age still have difficulty understanding abstract concepts such as fractions.

2. Learning Obstacle deals with the Fractional Concept as Part of the Whole.

Learning obstacle that may come up next is that students can one understand the meaning of 'part of the whole', Van de Walle, Karp, and Bay-Williams (2013) states that students may think that is two parts of a three-part big same. For example, in the following figure, the students could mention the green part is \( \frac{3}{3} \) a part, but in fact the green is \( \frac{1}{2} \) part.

![Figure 1 student can make misconception about the green part](image)

This difficulty can occur because the previous student did not learn first about the equal partition in the fraction. Students need to understand that the whole in a fraction consists of equivalent parts. This material also deals with fractions worth to indicate that there are two fractions whose numbers are different but have the same value, so the material should be taught sequentially.
3. Learning Obstacle deals with Fractional Value
   Students may think that value of fraction such as $\frac{1}{5}$ is less than $\frac{1}{10}$ because 5 less than 10. Because students learn first about the number or natural number, students think that the numbers contained in the fraction have the same value to the natural number. This can also happen if students do not see fractions as a whole number.

   To avoid this obstacle, learning to compare the fractional values needs to be taught after students learn the basic concepts of fractions. A comparison of values that typically use this number line can measure students' understanding of the value of a fraction.

   Van de Walle, Karp, & Bay-Williams (2013) suggests that teachers should not give the rule that 'the value of the inverse fraction of the integer’ ie, the smaller the number of the denominator, the greater the value, unless with proving the reason. It can make students overgeneralizing that $\frac{1}{5}$ is greater than $\frac{7}{10}$.

4. Learning Obstacle deals with Fractional Operations
   The difficulty of operating these fractions is often found in learning. In the case of the following addition operation such as $\frac{1}{2} + \frac{1}{2} = \frac{2}{4}$, students use the rules of integer operations, summing the numerator with the numerator and the denominator with the denominator. This can happen if students view fractions as two separate numbers, hence the basic concept of the fraction needs to be completely understood by the student before moving on to the fractional operation.

   In the case of multiplication operations, students also may confuse because the product multiplication on the fraction with the original number of its value becomes small, for example on $\frac{1}{2} \times 6 = 3$ (Khairunnisak, Maghfirotun, Juniati, & De Haan, 2012). This is not appropriate with the principle of the multiplication of integers where the product is always greater than the factors. Just as in the previous case this can also happen when the fractional learning course does not begin with the use of representative objects. In the case of fractional multiplication, students should also be introduced first with fractional multiplication with integers before the fractional multiplication with fractions. Fractional operations with integers are easier to understand because they can be associated with integer multiplication operations.

SUGGESTION

By knowing the fractional material demands, teachers can prevent student learning barriers. Although the incoherence found in the curriculum, teachers can overcome it by providing initial knowledge related to the material to be studied. This is why teachers and prospective teachers have to analyze teaching materials.

BIBLIOGRAPHY


