

# Meaning of Fractions

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**Abstract.** Introducing fractions is identical to divide an object. Suppose we divide the apple into two parts. One divided into two parts, the question arises whether one part can be called a half or not. Based on this activity, how can students give meaning to fractions. This study aims at designing a different fractions lesson by applying Didactical Design Research. In doing so, we undertook several research phases: 1) thinking what is fractions and why students should learn this concept; 2) designing didactical situation based on identified learning obstacles; and 3) reflecting retrospectively on the lesson design and its implementation as to redesign the fractions lesson. Our analysis revealed that most students held epistemological obstacles in giving meaning of fractions because they only know fractions as numbers that have numerator and denominator. By positioning ourselves as students, we discuss the ideal design to help students in constructing the meaning of fractions.

## 1. Introduction

Reference teachers usually teach the curriculum and textbooks. The curriculum used as a reference for decision making related to the election materials, learning objectives, and measures of learning. Textbooks used as a reference in the selection of materials and the plot. In practice, the teacher usually first learn the material content of the textbook. Then, the next morning he was to transfer the knowledge to the students, so that students tend to learn in one direction. When the teacher out of the classroom, it ended its activities.

In elementary school, students begin to learn fractions ranging from grade 3 to grade 6. The curriculum has been mapped this topic into several sections according to the capacity of students in each level. In grade 6, fractional topic focuses on fractional multiplication and division operations. Our initial analysis of the students' learning experience previously indicated likely students are still not getting the meaning of fractions. This is a result of the learning experience of students who merely accept it, without making the process of getting something. If learning imposed on the operation of multiplication and division of fractions, then the students will experience learning obstacles. To anticipate the learning obstacles, it is important for us to establish the meaning of fractions in the classroom with students as a first step [2].

From the life history class, our teacher explained that students accustomed to dependence on others when in difficulty. They tend to ask the teacher directly without trying to find out the answer to friends who can. As a result, the teacher asks the students could visit a friend who has not been able to provide assistance. It turned out that this dependence as a result of the habits of the students who learn imitative. They often do not get the room to explore their capabilities, but only receive, accept, and



accept. That is, there are other things to consider besides the material in the learning process, namely class life.

This paper is not intended to debate whether things above are true or false, but is intended to distribute a collaborative learning experience that we have implemented. Here we will discuss how we jointly collaborate in creating a learning that is rich in meaning, ranging from design, implementation, up to reflection. The goal is to build the care and concern of teachers to students' development as well as life in society as a decision-making basis professionalism [4].

## 2. Experimental Method

This study applies the method didactical Design Research through three stages of analysis. The first reflection for action made prior to the implementation of learning in which the main focus Repersonalisasi prospective analysis through the process and re-contextualization of teaching materials underlying the design of didactic hypotheses included the anticipation. Second, reflection in action undertaken during the learning process by applying the Metapedadidactic analysis (unity, flexibility, and coherence). Third, reflection of action that is performed after learning through a retrospective analysis comparing the situation with the hypothesis didactic Metapedadidaktik analysis [5].

The main focus of the study were to assess the learning needs of students and to develop a didactic design based learning obstacle and didactic learning trajectory so that the design is expected to improve and develop the learning process towards better and be able to overcome learning obstacles experienced by students. Subjects of this study is a 6th grade elementary school students in one school in Bandung.

## 3. Result and Discussion

The thought process of a teacher [3] occurred in three phases, namely before learning (reflection for action), when learning takes place (reflection in action), and after learning (reflection on action). All three reflect the thought process of curriculum development framework at the level of practical implementation (enacted curriculum) in the classroom (learning). This will be the basis of discussion of our findings.

### 3.1. First Phases: Being Student

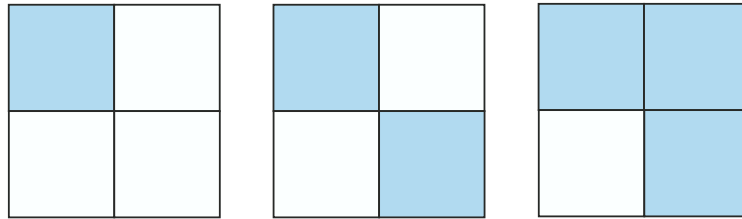
In this phase, we are exploring a series of questions about 'the content of what material should be taught?' And 'how should the content of the material taught?'. The reason is to guide teachers when choosing the content of the materials and methods relating to the characteristics of a number of students were taught to the period of time and a certain place. As for the question 'why' and 'what' that helped develop a variety of reasons and the purpose behind the teacher's choice. The last question that is important to be explored for more leads and strengthen teachers' belief that certain material content is more important and valuable to students than others [4]

The questions that eventually led us into more specific questions, namely: 1) What is the meaning of fractions for ourselves ?; 2) How do I introduce fractions to students so that they acquire meaning ?; and 3) How is the response of students to learning situations we design? Through discussions deep enough, we interpret the fractional part of the whole.

Once we are able to construct meaning for ourselves fractions, the next challenge is how to introduce fractions to students. The way varied, some use apples, cake, paper, chalk, and so forth. First, we try to apples. Suppose an apple we divided into two parts to introduce  $\frac{1}{2}$ . After the apples are cut, we are not confident to say that 1 parts is  $\frac{1}{2}$  because the concept of fractions said every part of it must be the same. Same here can be just as much, the same length, and another that has a standard size. While the results of the apple pieces can be seen from the side of the weighing also its size. This can lead to ambiguity in the minds of students. If using some other foods like cake and pizza is also the case will be the same as apples. The second idea that emerged was to use chalk. Chalk split into two with broken. Given the nature of chalk that is easily shattered when broken, we think if the pieces

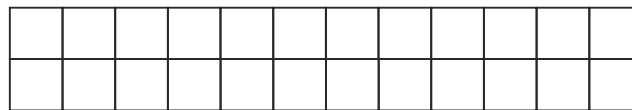
are recombined, the result will not necessarily be returned intact into one. Can be seen, nor tubular chalk so that the balance is not the same on the right and left. Another option is to use paper. Paper is more easily divided into several equal parts by means of folded or cut, even can also shaded [1].

Fractional didactic design construct meaning we finally decided to use paper, paper precisely terraced. Design, teachers will encourage students to shading terraced paper representing a value of  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$ . Typically, the value of  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$  introduced as shown in Figure 1. That's the simplest way of introduction.



**Figure 1.** Figure 1 show that the simplest way of introduction fraction, such as  $\frac{1}{4}$ ,  $\frac{2}{4}$ , and  $\frac{3}{4}$

This time we want to provide more challenge to the students, because they are the 6th grade. The terraced paper that should be shaded students will be provided in a size of 12 x 2 as shown in Figure 2 and must be shaded in five different ways.



**Figure 2.** Figure 2 show that the terraced paper that should be shaded students for representing a value of  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$  in five different ways

Interest ask students to shading with five different ways in which the first is to lure cooperation. We plan to make students sit in groups, each consisting of four students. Each group will be given 20 sheets of paper's puzzle (each 5 to work on  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$ , and 5 for backup). Secondly, we want to spark the creative power of students, because they should not be shading in the same way. Thirdly, we hope will appear among children in the class collaboration in completing the challenge. So the media is not just facilitate the students in solving the problems, but also to develop the potential and social life. More away, the nature of child dependency can be reduced.

To find out the possibilities of the ideas of the students, we try to direct shading in the terraced paper along with several other fellow teachers. An important point of this activity is that we can feel what the student. If before we think of the student's perspective, so this time we move as a student. The benefit is the teachers will be more confident with the election-election with still no grace period to repair if there is something lacking. Momentum like this can make the design more and more mature.

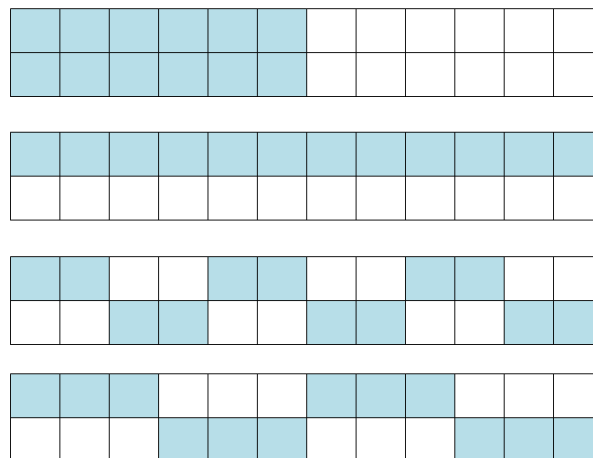
### 3.2. Second Phases: Learn from Students

The learning objectives of this day is that students can make sense of fractions, since their foundation in learning is next. There are some findings that we gained in the classroom when the implementation takes place. First, students confused when asked shading  $\frac{1}{2}$  in five ways. This is in accordance with our expectations. The confusion is a result of everyday students who are accustomed to know one answer. They are also not used to try to directly before the given example. Anticipation that teachers do when all students give a hint of confusion is simple, does not give an example.

The second discovery occurred in the group Marni and Siti. Siti trouble shading  $\frac{1}{3}$ . Siti invited the teacher asked the group Marni. Siti has not been accustomed to ask, so he accompanied the teacher. When finally Siti asked, Marni reluctant to answer. Chances are there are two, Marni doubt about the answer or is still not able to share the results of his efforts for finding a way shading  $\frac{1}{3}$  was quite difficult. But with the guidance of teachers, Marni finally answered questions Siti taste.

Findings third occurred in the group Eneng and Lilis. Eneng groups who have difficulty shading  $\frac{1}{4}$  invited the teacher asked the group managed to get guidance Lilis good problem solving. Lilis groups answer questions not to show the answer, but the guiding Eneng by systematically asking questions, such as: 1) How many box ?; 2) If you want shading  $\frac{1}{4}$ , how the results of 24 divided by 4 ?; 3) So how much should you hatched? Seeing the incident, Marni learn from Lilis humble, so that finally they changed for the better. Another difficulty the student group was eventually by itself going to ask her. Teachers successfully played rhythm of new life in the classroom. Gradually, the atmosphere of collaboration between students in the class formed gently.

Eventually it was revealed that the learning objectives that the teacher wants the students can actually collaborate in the classroom, ranging from attempted when in difficulty. He was deliberately invites students who struggle to ask the students who are able to be in the habit of changing for the better class. Usually, the teacher could ask students to tell the students who are struggling. This time, he wants to play behind them. The formation of this new culture cannot be separated from a challenge. Therefore, when the teacher asked us to ask, he was setting up the guidelines, namely: 1) Try to ask your difficulties before; 2) Try to help her friend not trouble again; 3) What did you tell your friends? Do you understand? If yes, please tell a friend in your group.



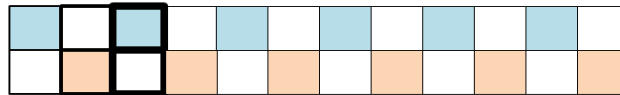
**Figure 3.** Figure 3 show that are some answers to students who appear in representing a value of  $\frac{1}{2}$ .

### 3.3. Third Phases: Learning from Students, Learning from Friends

When reflection, students become our primary focus. We each shared our findings on the activities of students in the class, which we call the learning of students. One interesting finding we are turned out Eneng a very quiet student. Everyday she only interact with her close friends. But that day we both saw her successfully demonstrated the courage to ask the group will be invited Lilis then distributed to friends of the results of their study group. This is a remarkable achievement Eneng.

Findings like that has always been a great conversation when reflections. We all know that not all students are monitored at the same time by the teacher. There is just something that will be missed by us as educators. This is where the function of reflection, sharing and fill in the blanks. As well as a finding that we learned from one observer about the way of thinking a boy named Gio. For shading

$\frac{1}{2}$ , Gio took two boxes and shading in one box, took another two boxes and shading 1 box, and so on (Figure 4). The same way Gio did for shading  $\frac{1}{3}$ , and  $\frac{1}{4}$ . But unfortunately, the way he was not understood by his friends and did not previously anticipated by the teacher. In fact, the very way shows the meaning of fractions.



**Figure 4.** Figure 4 show that how Gio thinking in shading terraced paper for representing a value of  $\frac{1}{2}$

How Gio think not anticipated earlier by us. In class, the teacher saw Gio shading it that way and say that it was wrong. Being aware that there are innocent teacher, the teacher admitted that he was wrong and apologize immediately to Gio. It also becomes important lessons for us that it is not permissible for us as educators justify to students. Today we find students who are considered 'less intelligent' apparently showing the mindset is unique, so unique that he had not considered before. It may be that during this time he was considered 'less intelligent' does not mean it can not be anything, but he has not facilitated their potential. Guilt teacher today is proof that the learning of the students is equal to self-correct without having patronized.

#### 4. Conclusion

The process of learning mathematics is nothing perfect. In it there is always the challenge: how to design meaningful learning of mathematics so that students understand it as a whole. From the series we have done, with the main focus of students, we found a few keys: 1) to position themselves into the student when the design process; 2) learning of students; 3) learn from my students and colleagues. If such activity is carried out continuously, then gradually shift the way we can all think of the imitative to more independent way of thinking. We hope that what we have done is a form of real manifestations to education.

The series of activities carried on not to assert its right or wrong in what he has done. But how can we put ourselves to learn from students and learning to hear the opinion of friends. Because in fact, learn from children make us more mature. The proof, learning that day has made students and teachers each become more mature. So here too we interpret that in a collaboration no caste, just as humans are created by God, not caste, just different course. And the differences that make us increasingly rich, not making us disunited. Its the same thing as  $\frac{1}{2}$  to  $\frac{2}{4}$ ,  $\frac{3}{6}$ ,  $\frac{4}{8}$ , and  $\frac{12}{24}$  have a numerator and denominator are different but have the same value that is  $\frac{1}{2}$ .

What we write here only a didactic situation of the whole learning process. In fact, in the learning process we have 3 pieces of this activity and the first activity. More than that, we're here together trying to be a skilled educator learning, not teaching experts.

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