



## Changing Shape Design Materials Didactic Fractions in Primary Class IV

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**Abstract.** This study aims to develop a mathematical didactic design on the material to change the form of fractions in elementary school, in order to obtain optimal learning outcomes. Compilation is based barriers to learning that occurs in the learning process. The study was implemented in one of the main primary schools in Sumedang, the fourth grade students as research participants consisted of 37 students. The method used is the method of DDR (didactical Design Research) with a qualitative approach which the researchers themselves act as instruments. The activities in learning starts from the set trajectory learning didactic pedagogical hypothesis and anticipation. That students are exposed to practice solving problems related to the conversion of fractions and follows the daily life, so that students can solve their own problems that it faces. The results showed that the preparation of mathematics didactic design the material to change the form of fractions in elementary school, there are students' responses to learning. Most students can achieve learning objectives that have been defined, didactic design means it can reduce the difficulty of learning.

**Keywords:** Design didactic, changing the form of fractions

**INTRODUCTION** ~Mathematics is part of the basic knowledge that should be invested in education, this is because the math is very involved in all aspects of life. This means that math is very important to learn and understand from an early age with good, not only for the sake of formal education, but also to help people in everyday life. Mathematics is rich in concepts related to each other. The concepts taught in primary school students such as geometry, algebra, statistics, integers and fractions. Fractions are part of one of the mathematical concepts introduced in class III Elementary School. Fractions always been a tough challenge for the students, even to the high school level. This is evident from the PISA results consistently show that students have a very low understanding of the concept of fractions, in addition to other mathematical concepts, especially related to mathematical literacy itself

(Istiandaru, 2014; Stacey, 2011). Fractions are considered difficult because it requires an understanding of how a certain part compared to the whole, and how states in certain symbols. Even the concept of fractions is regarded as a difficult concept to be learned (difficult, to learn) and it's hard to be taught (difficult, to teach) to delivery of ongoing pedagogical challenge among the mathematics education community (Bruce et al, 2013; Charalambous, 2005). in addition to other mathematical concepts, especially related to mathematical literacy itself (Istiandaru, 2014; Stacey, 2011). Fractions are considered difficult because it requires an understanding of how a certain part compared to the whole, and how states in certain symbols. Even the concept of fractions is regarded as a difficult concept to be learned (difficult, to learn) and it's hard to be taught (difficult, to teach) to delivery of ongoing pedagogical



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Based on preliminary studies that have been done, there are some barriers to learning experienced by students associated with math skills on the material to change the form of fractions, namely:

1. *Learning obstacle* Type 1, related to understanding change fractions into a percent, and vice versa
2. *Learning obstacle* Type 2, associated understanding of change as a decimal into a fraction, and vice versa.
3. *Learning obstacle* type 3, related to the matter of the story apply to change the understanding of fractions.

Deep understanding of the concept of fractions is necessary, this is because the problem shards found in everyday life. An understanding of fractions is important for

students as a prerequisite for mathematical concept further understood both at the level of higher education as well as in the context of everyday problems (Siegler, 2013). In order to achieve that, we need a basic understanding as a strong foundation at the time of the introduction of the concept of fractions (Idris & Narayanan, 2011).

Given the importance of the concept of fractions for elementary school students, the learning of the student must be meaningful, so as to support the further material and most importantly, can be applied in dealing with problems of later life. Meaningful learning process for students will be created if the draft the learning process based on consideration of the initial readiness and ability of the students (Suherman, Turmudi, Suryadi, Herman, Suhendra, Prabowo, Nurjanna, and Tohati, 2003: 29). One effort to do that is by developing the design of didactic learning fractions.

Attempted didactic design applied to the fourth grade students in the material fractions, with the aim of minimizing the barriers to learning faced by students that can cause learning disabilities (Learning Obstacle) for students. So that students are able to understand the concept of a material as a whole. By using didactic design students are no longer expected to meet with obstacles in understanding mathematical concepts. In this model the learning process of a relationship triad (triangle) between teachers, students and



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the material. Triangles depict didactic pedagogical relationship (HP) between teachers and students as well as didactic relationship (HD) between students and the material is an important aspect of learning.

Relationship between teachers and students or relationship Pedagogical / HP (pedagogical relations) while the relationship between students and called the relationship didactic material / HD (didactical relation), According to Suryadi (2010) HD and HP is not viewed partially but can occur simultaneously. Said also that the relationship between teachers and the material can not be ignored. In this case, the teacher can design a situation didactic and make predictions of student responses and anticipation to create a new situation that is the relationship situations anticipation among teachers and students, called Anticipation didactic Pedagogical or ADP (Sulistawati, Loc. Cit., P 136) , ADP can create a didactic situation (didactical situation) that resulted in the student learning process (learning situation). This means that a teacher other than the need to master the teaching materials, also need to have knowledge of any other matters related to students and created a situation didaktias to encourage the learning process optimally. The disadvantage can not be done by the situation of teachers and learners are passive who did not master the teaching material and are less aware of the student's knowledge because the implementation will not be optimal. If HD,

HP, and ADP could walk and teachers act in the context of this didactic triangle can create a didactic situation to optimize learning (AN Sahid, and D.Suryadi: 2016). The research procedures performed include: The disadvantage can not be done by the situation of teachers and learners are passive who did not master the teaching material and are less aware of the student's knowledge because the implementation will not be optimal. If HD, HP, and ADP could walk and teachers act in the context of this didactic triangle can create a didactic situation to optimize learning (AN Sahid, and D.Suryadi: 2016). The research procedures performed include: The disadvantage can not be done by the situation of teachers and learners are passive who did not master the teaching material and are less aware of the student's knowledge because the implementation will not be optimal. If HD, HP, and ADP could walk and teachers act in the context of this didactic triangle can create a didactic situation to optimize learning (AN Sahid, and D.Suryadi: 2016). The research procedures performed include:

1. Implementing the didactic design that has been designed on learning in the fourth grade.
2. Recording the learning process of learning to produce images.

Learning design (design lesson) consists of a didactic situation that is accompanied by predictions of student responses on the situation didactic and pedagogical



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didactic anticipate that will be done. The design is based on the learning objectives as contained in the curriculum 13 that includes the introduction of fractions, equivalent fractions, the kinds of fractions, and solve problems related to fractions.

Uraian Based on the above, the purpose of this research is to produce didactic design alternative to the material change fractions in fourth grade.

## METHOD

This study used a qualitative approach and descriptive method where researchers themselves act as instruments (human instrument). The study design will be developed referring to didactical Design Research (DDR) is a design development process didactic consists of a series of situations didaktis, analyze student responses that occur over the situation didactic developed and decisions taken during the learning process (Suryadi, 2015 ). This study will explore the central phenomenon is the development of a didactic designs on changing learning fractions by considering the obstacles encountered, describes the process of implementation of the didactic design from several perspectives during the design implementation process didaktif. The research subject Elementary School fourth grade students Cipareuag by the number of students 37 people. The fourth grade students are participants who will get learning with didactic design that has been designed by the researcher.

## RESULT

The main result of this research is the development of the design of didactic as an alternative to minimize the difficulties faced by the students, in the form of teaching materials material fractions are taught in fourth grade, in the form of a summary of the examples solve problems fragments associated with these kinds of fractions and conversion fractions. Shows can minimize the difficulty of learning (learning obstacle) experienced by students. It was not as optimal as expected, because some students still show can not complete the assigned task, because the students up to class IV did not all meet the criteria. That is the provision of government in the curriculum of 13 should not be any students who live classes, so students to the next grade with enforced. And should they still repeat in the previous class, to be able to adjust its development. In the end they were dragging on, let alone work, reading is still not fluent.

## DISCUSSION

Didactic design concept of changing the shape fraction IV class was developed to minimize the difficulty of learning (learning obstacle) and designed in several Lesson Design. In Lesson Design developed a didactic situation in the form of problems and learning activities associated with the relationship between mathematics and related topics to real life. Each situation didactic planned fitted with a predicted response along with anticipation didactic pedagogical students on the response.

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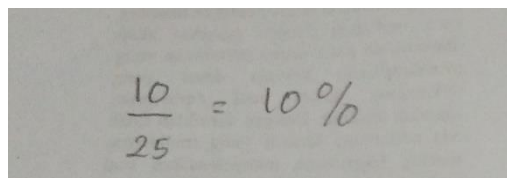
Anticipation didactic didactic pedagogical in every situation in every lesson design are generally in the form of strengthening action on student responses appropriate and guidance on students' responses are not appropriate. Strengthening do teachers give students questions to dig behind rational response given. The guidance efforts with more emphasis on students who experience learning obstacle by way of explanation of the concept to the students in small groups or individually. Didactic situation in the form of questions given in the form of worksheets, once students get an explanation and practice solving

problems. The series of didactic situation in each lesson design in question is:

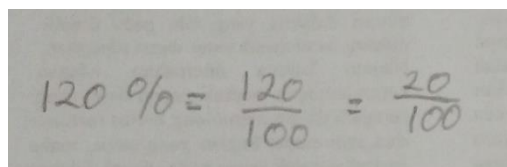
**Lesson Design 1**

*Learning obstacle* category 1, related to understanding the concept of numbers per cent, that students can not change the form of fractions to form percent, and vice versa. The following questions were tested, representing the concept of number percent of category 1, in which students were asked to change a common fraction to form percent and about changing the percent to a fraction mixture.

Define terms of percent of  $\frac{10}{25}$  !


$$\frac{10}{25} = 10\%$$

Change 120% manjadi fractional mix!


$$120\% = \frac{120}{100} = \frac{20}{100}$$

Based on the students' answers in figure 1, seen student numbers per cent thought that equal the number the numerator of the fraction. In answer to Figure 2, associated with understanding the change percent to fractions. Students are still not familiar with the fractional percent that percent is to be changed and simplified to a common fraction or fractional mix.

Based on the above learning obstacle, possibly including epistemological barriers that type of barriers to learning caused by the limitations of the context presented and due to factors that teachers do a didactic situation is less clear in teaching the concept of changing the form of fractions. Efforts to do is to assert repeatedly about percent.

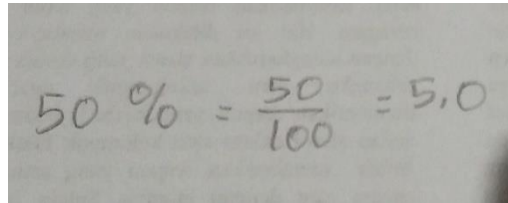
**Lesson Design 2**

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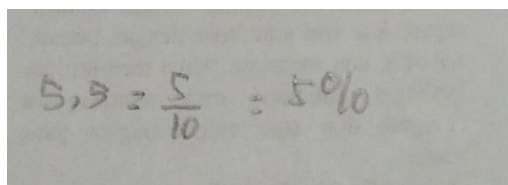
*Learning obstacle 2* categories associated with the students' understanding changing

the shape percent ke bentuk decimals and vice versa.

Change 50% to decimal form!


$$50\% = \frac{50}{100} = 5,0$$

5.5 Change into shape percent!


$$5,5 = \frac{5}{10} = 50\%$$

Mengantisipasi obstacle to learning that terkait with the concept of changing the shape percent to decimal and vice versa, didactic design designed by presenting various forms of exercise that is repeated with different figures.

### **Lesson Design 3**

*Lesson obstacle3* categories associated with the ability to translate and complete the story about fractions. To avoid re-occurrence of resistance in this category, then one attempts to do is to present the context of early learning in the form of problems related to real life. With the existence of this context, the lesson is directed to address and solve these problems.

### **Revision didactic design**

In this revised design no deep change in terms of forms of activity on the didactic situation. Changes in the administration is

more emphasis on exercise and work on the problems in terms of the number of meetings to material considered heavy. Also based on the idea that every activity pembelajaran must begin and be associated with a real life context that has been experienced by students, the design of the didactic situation at the third meeting about resolving issues related to the fractions given exercises that represents all of the discussion about the material to change the form of fractions. The following draft revision of the intended didactic design.

### **Lesson Design revision 1**

*Lesson designrevision 1* was basically no change in the total circuit didactic situation. Didactic situation that existed at the beginning of the didactic design can still be given. However, because there is a general trend to student responses that are uniform in regard numeral percent the same as the numerator in the fractional numbers, the teachers emphasize again



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how to seek percent, which makes the denominator in the fraction into a hundred by multiplying the denominator by a number. In contrast to remodel percent to a common fraction or mixture with the change in the form of fractions percent, and then reduce it until it becomes the most simple fraction or a simple mixture into fractions.

Learning design constraints Lesson 1

Change  $\frac{10}{25}$  became percent!

completion:

$$\frac{10}{25} = \dots / 100 \text{ (Denominator was made to 100)}$$

$$\frac{10}{25} = \frac{40}{100} = 40\% \text{ (multiplied the numerator and denominator by the same number, ie 4)}$$

$$\text{So, } \frac{10}{25} = 40\%$$

Change 120% into fractions

mix!

completion:

$$120\% = \frac{120}{100} \text{ (Percent converted into percent)}$$

$$= 120:20$$

$$100:20$$

(Simplify fractions by dividing the denominator and the numerator by the same number)

$$= \frac{6}{5} = 1\frac{1}{5} \text{ (Common fraction converted into fractional mix)}$$

$$\text{Thus, } 120\% = 1\frac{1}{5}$$

**Lesson Design Revision 2**

As in Lesson design revisions 1, the improvement of learning is emphasized on the concept percent. By being able to determine percent that means percentile, which further simplifies the fractional guided so that students will easily continue solving problems.

Learning design constraints Lesson 2

Change the form of 50% to decimal form!

completion:

$$50\% = \frac{50}{100}$$

$$= 50:50$$

$$100:50$$

$$= \frac{1}{2} \text{ of 1 divided 2 didapat result 0.5}$$

$$\text{Thus, } 50\% = 0.5$$

5.5 Change into shape percent!

$$5.5 = \frac{55}{10}$$

$$\frac{55 \times 10}{10 \times 10} = \frac{550}{100} = 550\%$$

$$10 \times 10$$

**Lesson Design revision 3**

In Lesson design revision 3, disajikam questions that can improve the ability to translate and solve problems concerning fractions, namely:

Components on a clean and dry air consists of 78% nitrogen, 21% oxygen and 1% other gases. Write each of these components in the form of ordinary fractions and decimals by completing the following table!

Compon ent	The amou nt (%)	commo n fraction	Desi mall
Nitrogen	78%	$\frac{78}{100}$ $= \frac{39}{50}$	0.78





Oxygen	21%	21/100	0.21
other gas	1%	1/100	0.01

## CONCLUSION

Through the development of a didactic design of the concept of fractions, it can reduce the barriers to learning that can cause learning disabilities (learning obstacle) during the learning takes place. Lesson plan (Lesson Design) composed of didactic situations to attract students to follow, and can involve enable all personal. While it still leaves some students disadvantaged by very poor basic skills support that lead to less learning motivation. It is used as a basis for developing a didactic design to the next in the upcoming school year.

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