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## Analysis Epistemological Obstacle Students in Completing Mathematical Stories Based on Cognitive Styles

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### Abstract

This study aims to determine the causes and describe the epistemological obstacle in students completing the math problem's operation based on cognitive style. The method used in this study is descriptive qualitative. The epistemological obstacle analyzed in this study are misconceptions, procedural errors, and technical errors, while the cognitive styles categorized in this study are field dependent and field independent. In this study, we processed data analysis using qualitative descriptive statistics and through three activity lines, namely data reduction, data presentation, and data verification or drawing conclusions, and used to get descriptive answers based on test data and interviews. The Group Embedded Figures Test (GEFT) test is used to determine students' cognitive style categories who will be categorized as independent fields and dependent fields. While the test of the mathematical story matter of the operating material calculates the fractions analyzed by the epistemological obstacle. We interviewed to gather information from the study subjects on an epistemological obstacle that occurred in students in solving mathematical story problems based on cognitive style. The research results revealed that students with independent fields and dependent fields still often make misconceptions, procedural errors, and technical errors in solving mathematical problem material in fractional calculation operations.

**Keywords:** *Learning Obstacle, Epistemological Obstacle, Cognitive Style, Field Independent, Field Dependent*

## Analisis Epistemological Obstacle Siswa Dalam Menyelesaikan Soal Cerita Matematika Berdasarkan Gaya Kognitif

### Abstrak

Penelitian ini bertujuan untuk mengetahui penyebab dan mendeskripsikan *epistemological obstacle* yang terjadi pada siswa sekolah dasar dalam menyelesaikan soal cerita operasi hitung pecahan matematika berdasarkan gaya kognitif mereka. Metode yang digunakan dalam penelitian ini adalah deskriptif kualitatif. Adapun *epistemological obstacle* yang dianalisis dalam penelitian ini adalah miskonsepsi/kesalahan konsep, kesalahan prosedur dan, sedangkan gaya kognitif yang dikategorikan dalam penelitian ini adalah *field dependent* dan *field independent*. Data pada penelitian ini menggunakan tes dan wawancara. Tes *Group Embedded Figures Test* (GEFT) yang digunakan untuk mengetahui kategori gaya kognitif yang dimiliki siswa yang nantinya akan dikategorikan menjadi *field independent* dan *field dependent*. Sedangkan tes soal cerita matematika materi operasi hitung pecahan yang nantinya akan dianalisis *epistemological obstacle*nya. Wawancara dilakukan untuk menggali informasi dari subjek penelitian tentang *epistemological obstacle* yang terjadi pada siswa dalam menyelesaikan soal cerita matematika berdasarkan gaya kognitif. Berdasarkan hasil penelitian yang telah dilakukan, terungkap bahwa siswa dengan bidang *field independen* dan *field dependen* masih sering membuat miskonsepsi, kesalahan prosedural, kesalahan teknis dalam menyelesaikan materi soal matematika dalam operasi penghitungan pecahan.

**Kata kunci:** *Hambatan Belajar, Hambatan Epistemologis, Gaya Kognitif, Field Independent, Field Dependent*

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## INTRODUCTION

In Indonesia and many countries, we have taught mathematics from early childhood education to high school. In many ways are done to improve the quality of mathematics education in Indonesia, including updating the curriculum, providing supporting devices, providing teaching aids, and providing mathematics teachers training. However, these efforts have not provided encouraging results to improve the quality of mathematics education.

The challenges of an ever-changing future and increasingly fierce competition require education graduates skilled in one field and critical and creative in developing their fields. This needs to be applied to every subject in school, especially mathematics. Therefore, the 2013 curriculum competency standard states that students are expected to have competency attitudes, knowledge, and skills ([Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia Nomor 65 Tahun 2013](#)). Competencies intended to be explained in the content standards for elementary and secondary education units in mathematics subjects have been stated that mathematics subjects need to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, and creative, and ability to cooperate ([Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 22 Tahun 2006](#)). So that curriculum content must always keep abreast of the development of science, culture, technology, and art, build curiosity and the ability for students to follow and make the most of the results of science, technology, and art.

Curriculum 2013 is an integrated competency and character-based curriculum that improves the Education Unit Level Curriculum (KTSP). This curriculum is seen to be following educational programs that are different from the previous curricula. These differences can be seen in the 2013 curriculum's several characteristics, namely the scientific approach and authentic assessment in learning. However, the field facts show that students are still experiencing an obstacle to learning in school, one of which is Mathematics. When learning takes place, students will be faced with learning obstacles. In [Brousseau \(2006\)](#), Bachelard and Piaget state that students' mistakes are not merely due to ignorance that is owned but is a result of the knowledge that has been owned, which turns out to be wrong. This type of error is erratic and unpredictable, which is an obstacle.

[Brousseau \(2006\)](#) states that there are three types of obstacles divided by the system (teacher-student-material)—see also [Rahmawati and Purnomo \(2020\)](#), namely the ontogenic obstacle arises due to the limitations that students have at the development stage. One of the cases is students' mental unpreparedness because of the mental and cognitive development that is far behind the biological development. The didactic obstacle is an obstacle experienced by students due to transferring knowledge from teacher to student. This obstacle is very much related to the way the teacher delivers the material to the students. Furthermore, this epistemological obstacle is caused by the limited knowledge of a person in a particular context. If students are faced with a different context, they will experience obstacles as if their knowledge is useless.

According to [Rahardjo and Waluyati \(2011\)](#), the form of the questions used to measure students' abilities in mathematics learning can be in the form of a matter of stories or non-story questions. The question is closely related to the problems that exist in students' daily lives to find solutions using mathematical sentences that contain numbers, count operations (+, -, x, :), and relations (=, <, >, ≤, ≥). The story matter is useful to train the development of students' thinking processes in an ongoing manner to achieve the established competency standards, but the conditions of mathematics learning at the elementary level, especially those that still often use lecture methods or explain in front of the class whether they have been conveyed the material to students, causing students to accept math lessons passively and be memorized. As a result, when students are given a mathematical problem that is slightly different from the example given by the teacher,

students complete it using their knowledge, which is sometimes not under the actual procedure. So that an error occurs when resolving these mathematical problems.

Students' mistakes need to be analyzed to find out the variation in errors made by students. Through analysis of errors will be obtained the type and location of errors made by students, so that teachers can provide the right type of assistance to students. According to [Kurniasari \(2007\)](#), the location of errors relates to students' mistakes in determining the steps to solving the problem, while the types of errors are related to calculation errors and the concept of problem-solving. By doing an error analysis, students get a clear and detailed picture of students' weaknesses in solving mathematical problems. Errors made by students can be used as material for teaching consideration to improve learning and teaching activities. The increase in learning and teaching activities is expected to improve learning outcomes or student achievement.

In solving mathematical problems, students do the thinking process so students can find answers. Thinking is a process that starts from receiving information from the outside world or within the student, processing, storing, and calling information from inside the memory, and changing cognitive structures. In the thought process, processing takes place for information entering the scheme (cognitive structure) in the human brain.

The purpose of the learning process is to acquire new knowledge. In the process of developing knowledge, an individual often experiences obstacles. Learning obstacle is an obstacle for difficulties that occur in the learning process. The difficulties faced by students when learning are not always the same, this happens because students have different obstacles in learning. In other words, these learning obstacles or difficulties cannot be avoided because they are part of every learning process.

[Brousseau \(2006\)](#) suggests three types of learning obstacles: ontogenic, epistemological, and didactical obstacles in the learning process. The ontogenic obstacle is the type of difficulty students have concerning children's readiness in learning. One of the cases is students' mental unpreparedness because of the mental and cognitive development that is far behind the biological development. Duroux states that epistemological obstacle is a type of learning difficulties due to limited context used when the concept was first learned ([Brousseau, 2006](#)). If students are faced with a different context, they will experience obstacles as if their knowledge is useless. The didactical obstacle is an obstacle experienced by students due to transferring knowledge from teacher to student. This obstacle is very much related to the way the teacher delivers the material to the students. In other words, this illustration is a learning difficulty caused by the state of didactic design used or didactic intervention of the teacher ([Suryadi, 2015](#)).

Cornu distinguishes between four types of obstacles: cognitive obstacle, genetic and psychological obstacle, didactic obstacle, and epistemological obstacle ([Sukirno & Ramadhani, 2016](#)). Furthermore, according to Cornu, cognitive obstacles occur when students experience difficulties in the learning process. Genetic and psychological obstacles occur as a result of students' personal development. Didactic obstacles occur because the teacher teaches nature, and epistemological obstacles occur because of the nature of the mathematical concepts themselves.

In [Maudy, Suryadi, and Mulyana \(2017\)](#), Herscovics explains that the development of individuals' scientific knowledge experiences many epistemological problems, where conceptual schemata in students experience cognitive constraints. Herscovics prefers to use the term cognitive constraints in the learning process and the term epistemological constraints when referring to the past. Epistemological constraints or obstacles are related to the cognitive obstacle, didactic obstacle, and ontogenetic obstacle.

Epistemological obstacles were first introduced in developing scientific knowledge by Bachelard ([Hanafi, 2015](#)). The development of scientific knowledge occurs in didactic situations and through the concept of information leaps ([Brousseau, 2006](#)). A leap of information is an acquisition of knowledge that is not felt. If the information leap is

hampered, epistemological constraints occur. The epistemological obstacle can cause stagnation of scientific knowledge and even a decrease in one's knowledge. According to Hercovics identified from Bachelard's work, epistemological obstacles consist of a tendency to rely on intuitive experience deception, a tendency to generalize and be caused by the use of natural language.

In this study, the learning obstacle was revealed, especially the epistemological obstacle in solving mathematical story problems based on students' cognitive styles. The epistemological obstacle analyzed in this study is concept error, procedure error, and technical error.

Naturally, the students' abilities in solving problems vary, so that there is a possibility that the errors caused are also different. In addition, students can also differ in how they approach learning situations, how to receive, organize, and relate their experiences. Students have their preferred ways of compiling what they see, remember, and think about. Permanent individual differences in how to compile and manage information and experiences are known as cognitive styles. Woolfolk states that cognitive style is a way for someone to receive and organize information from the surroundings (Hidayat, Sugiarto, & Pramesti, 2013). Differences in cognitive style are related to the way a person feels, remembers, thinks, solves problems, makes decisions, which reflects the habits of how information is processed.

In Hidayat et al. (2013), Woolfolk states that cognitive style is a way for someone to receive and organize information from the surroundings. Differences in cognitive style are related to the way a person feels, remembers, thinks, solves problems, makes decisions, which reflects the habits of how information is processed. In Uno (2006), Ausburn formulates that cognitive style refers to a person's cognitive processes related to knowledge, understanding, knowledge, perception, thought, imagination, and problem-solving.

The definition for individuals with cognitive style dependent fields (FD) and individuals with independent field cognitive style (FI) according to Liu & Ginter (Onyekuru, 2015; Sayogo, Siswanto, & Nurafni, 2020) is explained as follows.

#### 1. Cognitive Style of the Dependent Field

The characteristics of field-dependent individuals (FD) in learning, namely 1) accept concepts and material in general; 2) it is rather difficult to relate concepts in the curriculum to their own experience or the initial knowledge they already have; 3) like looking for teacher guidance and guidance; 4) requires a gift or award to strengthen interaction with the teacher; 5) likes to work with other people and respect the opinions and feelings of others; 6) prefer to cooperate rather than work alone; 7) prefers the organization of material prepared by the teacher.

Students with cognitive field-dependent styles use a passive approach to learning. Learning objectives tend to be followed as they are so that well-structured learning goals are needed. Learning field-dependent individuals want learning material that is well structured and externally expressed, external motivation, external reinforcement, and teacher guidance.

#### 2. Cognitive Field Independent Style

Individual Field Independent (FI) characteristics in learning, namely: 1) focus on curriculum material in detail; 2) focus on facts and principles; (3) rarely interact with the teacher; (4) formal interaction with the teacher is only done to do the task and tends to choose awards individually; (5) prefer to work alone; (6) prefer to compete; and (7) able to organize information independently.

In Bendall et al. (2019) Riding states cognitive styles into several groups, including: 1) field-dependency-independency; 2) levelling sharpening; 3) impulsivity-reflectiveness; 4)

converging-diverging thinking; 5) tall holist-series; 6) assimilator explores; 7) adaptors-innovators; 8) reasoning-intuitive active/mlative; 9) abstract-concrete thinker and 10) verbaliser-visualiser. This study uses cognitive style field-dependency-independence because information processing in cognitive style is based on the dependence or non-dependence on environmental factors. This review is based on each individual's differences in dependence on the environment when carrying out analysis, thinking, and learning.

A person who has a field-independent cognitive style (FI) tends to be less interested in social phenomena and prefers abstract ideas and principles, less warm in interpersonal relationships, and feels efficient working alone. People who have a field-dependent cognitive style (FD) are categorized as one who can think globally, behave sensitively socially, and be interpersonal oriented, prefer working groups in doing their jobs. The existence of differences in cognitive styles influences the mindset and behavior of students. Students with independent field cognitive style will have a different mindset than students with field-dependent cognitive style. Therefore, solving mathematical story problems related to operating material fraction counts raises several opinions from each student that determine the student's correct or wrong answer. Errors in student answers can be made possible because of receiving and organizing information that is not right but is still used by students for reasons of answering.

Another thing that makes students' answers wrong is that they are right in managing the information they get, but they make mistakes in calculating fractions in solving story problems. Another mistake that might be made is that students are only less thorough in completing answers, causing an incorrect answer. Therefore, the researcher conducted a study with the title "Analysis of Epistemological Obstacle Students in Solving Mathematical Stories Based on Cognitive Style."

**METHODS**

This research was conducted in Pademangan Barat 11 Elementary School, Jakarta, in an even semester of 2018/2019. Data analysis in this study was processed using descriptive qualitative statistics and three activity lines, namely data reduction, data presentation, and data verification, drawing conclusions, and obtaining descriptive answers based on test data.

This study's data analysis technique, namely, Data Reduction or collecting data, is done by testing Group Embedded Figures Test (GEFT) and testing mathematical story matter, fraction counting operations, and interviews with the subject. Presentation Activities Data is carried out by grouping GEFT test results data given to subjects grouped into two groups (field-independent and field-dependent). The categorization or classification of field-independent students and field-dependent students and their scores are presented in [Table 1](#) below.

Table 1. Cognitive Style Category

Score	Cognitive Style category
0% < cognitive style ≤ 50%	Field Dependent (FD)
50% < cognitive style ≤ 100%	Field Independent (FI)

The GEFT test results will be described based on cognitive style characteristics, then categorized into independent field students and field-dependent students. From the categorization, there will be taken two students from each of these categories to be given a test of mathematical story questions, the operating material, the fractional count, which will be analyzed by the epistemological obstacle. The researcher will then describe students' epistemological obstacles based on independent field students' cognitive styles

and field-dependent students. After analyzing the test results, the researcher will conduct interviews with the two students to complete the test's information. Data on the results of tests and interviews will be simplified so that it is easy to analyze and draw conclusions.

Group Embedded Figures Test (GEFT) is a set of psychometric tests developed by Witkin et al. (see Mykytyn Jr, 1989) that are used to determine students' cognitive style categories who will be categorized into independent and field-dependent cognitive field styles. Whereas the test of mathematical story questions for the operation material of the fraction calculation is used to find out the epistemological obstacle that will be analyzed based on each student's cognitive style categories. Both of these instruments, before use, will be validated beforehand by experts.

After the research subjects, interviews were carried out on tests of mathematical story matter material to operate the fractions that were given. Interviews were conducted to gather information from the study subjects on epistemological obstacle students who appeared while working on mathematical problem material tests for fraction counting operations.

## FINDINGS AND DISCUSSION

The selection of research subjects begins with cognitive style ability tests using the instrument Group Embedded Figures Test (GEFT). The researcher tested the Group Embedded Figures Test (GEFT) on class V students of SDN Pademangan Barat 11, with 27 students in that class. The test results of the Group Embedded Figures Test (GEFT) can be seen in Table 2.

Table 2. Cognitive Style Test Results (GEFT)

<b>Cognitive Style</b>	
<i>Field Independent</i>	<i>Field Dependent</i>
11 Students	16 Students

Based on the results of the cognitive style test in Table 2, it can be seen that of the 27 students who took the GEFT test, there were 16 students had a field-dependent cognitive style (FD), and 11 students had an independent field cognitive style (FI). After the GEFT test is done, the researcher selects two students, each student represents the field-dependent (FD) category, and one student represents the field independent (FI) category. The selected students from each cognitive style category were given a test of the story matter of the operational material to calculate the fraction to analyze the epistemological obstacle.

In describing the results of the epistemological obstacle analysis, the researcher gave the code for each selected subject/student, namely (1) students who had a score of 12 and had an independent cognitive style, i.e., subject 11 were given an FI-1 code, (2) students who had a score of 11 and has a field-dependent cognitive style, namely subject 12 coded FD-1. This study's epistemological obstacle is aspects of conceptual errors, procedural errors, and technical errors.

### 1. Epistemological Obstacle Analysis on Mistakes of Conceptual Aspects

The written results of FI-1 students (field-independent) when working on mathematical problem questions on the operating material for the fraction calculation are given for number 1, then analyzed and conducted interviews with students to further explore the mistakes they made. The description of FI-1 students' mistakes in completing fraction counting's operational problem can be seen in Figure 1 below.

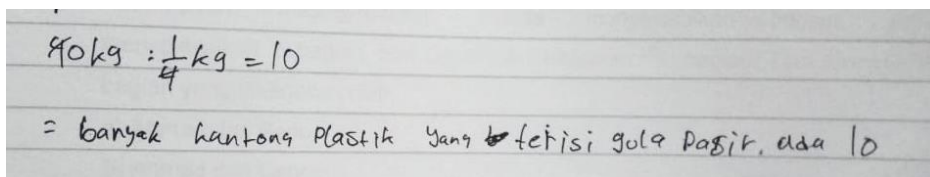


Figure 1. Student Answers FI-1 in Problem Number 1

Based on the answers of FI-1 students in Figure 1 with the question, "Mother bought 40 kg of sugar. The sugar will be sold retail with plastic wrap, each weighing  $\frac{1}{4}$  kg. how many plastic bags with sugar to sell? " FI-1 students have understood the story, but the fatal mistake is at the end of the answer. This student hurriedly answered so that he paid little attention to the distribution operation. Students multiply 40 kg with  $\frac{1}{4}$  to produce 10, which should multiply 40 kg by 4 so that the result is 160. To find out the cause of the error, the following excerpts of the interview.

Researcher : look again at your answer number 1  
 FI-1 student : (see answer number 1)  
 Researcher : what error did you make?  
 FI-1 students : the final result, Sir  
 Researcher : why?  
 FI-1 students : I am in a hurry, Sir. So I am not careful.  
 Researcher : even though you have written a sign of distribution operation.  
 FI-1 students : Yes Sir, I am in a hurry.

Furthermore, the written results of FD-1 students (field dependent) when working on mathematical story problems in the operating material for the fraction calculation are given for number 1, then analyzed and conducted interviews with students to further explore the mistakes they made. The description of the FD-1 student's mistakes in solving the operational problem with the fraction calculation can be seen in Figure 2 below.

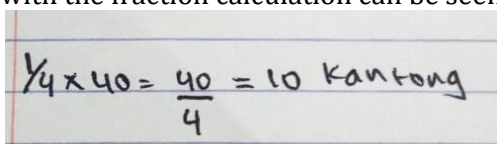


Figure 2. Student Answers FD-1 in Problem Number 1

Based on student answers FD-1 in Figure 2 with the question "Mother bought 40 kg of sugar. The sugar will be sold retail with plastic wrap, each weighing  $\frac{1}{4}$  kg. how many plastic bags with sugar to sell? " Student FD-1 lacks understanding of the story, so the fatal mistake is at the end of the answer. FD-1 students multiply 40 kg with  $\frac{1}{4}$  to produce 10, which should multiply 40 kg by 4 so that the result is 160. To find out the cause of the error, the following excerpts of the interview.

Researcher : look again at your answer number 1  
 Student FD-1 : (see answer number 1)  
 Researcher : what error did you make?  
 FD-1 students : multiplied, Sir  
 Researcher : why?  
 FD-1 students : I think multiplied, Sir.

## 2. Epistemological Obstacle Analysis on Mistakes of Procedural Aspects

The written results of FI-1 students (field-independent) and FD-1 students (field dependent) when working on mathematical story problems in the operating material for

the fraction calculation are given for number 2, then analyzed and conducted interviews with students to explore other related errors. Descriptions of FI-1 students and FD-1 students' errors in solving operational problem-solving questions for fractions can be seen in the following figures 3 and 4 below.

$1.000.000 \times 2/100 = 10.000 \times 2 = 20.000 \times 12 = \text{Rp. } 240.000$   
 Jadi yang harus di ..., selama setahun Rp. 1.240.000  
 Perbulan Rp. 103.000

Figure 3. Student Answers F1-1 in Problem Number 2

$1000.000 \times 2/100$   
 $= 10000 \times 2$   
 $= 200.000 \times 12$   
 $= \text{Rp. } 240.000$   
 Jadi yg harus dibayar  
 selama setahun Rp. 1.240.000  
 Perbulan Rp. 103.000

Figure 4. Student Answers FD-1 in Problem Number 2

Based on [Figure 3](#) and [Figure 4](#) with the question "A businessman borrows capital of Rp. 1,000,000.00 in banks with a single interest of 2% per year. If he borrows for one year, determine the loan amount that must be returned every month? FI-1 and FD-1 students do not fully understand the story, so errors occur in performing the procedure. The fatal mistake is when students multiply one year of interest Rp20,000 with 12 so that the final result of unfair distribution is  $\text{Rp. } 1,240,000 \div 12 = \text{Rp}103,000$ , which should be  $\text{Rp. } 1,020,000 \div 12 = \text{Rp. } 85,000$ . To find out the cause of the error, the following excerpts of the interview.

Researcher	: try to look at your answer number 7
Students FI-1 and FD-1	: (see answer number 7)
Researcher	: where did you make a mistake?
FI-1 students	: flowers, sir
Researcher	: why?
Student FD-1	: This is Sir, because it's multiplied by 12. It shouldn't be Sir, because it's already been an interest for one year.
Researcher	: well ... now you understand it's not where it's wrong

### 3. Epistemological Obstacle Analysis on Mistakes of Technical Aspects

The written results of FI-1 students (field-independent) when working on mathematical story problems in fraction counting material are given for number 3, then analyzed and conducted interviews with students to explore further related to the mistakes they made. A description of the errors of FI-1 students in solving the fraction operation story problem can be seen in [Figure 5](#).



3 a.  $\frac{3}{8} + \frac{1}{4} = \frac{3+1}{8} = \frac{4}{8}$   
 b.  $\frac{3}{8} + \frac{15}{40} = \frac{15+15}{40} = \frac{30}{40}$   
 c.  $\frac{1}{4} + \frac{15}{40} = \frac{10+15}{40} = \frac{25}{40}$

Figure 5. Student Answers F1-1 in Problem Number 3

Based on the answers of FI-1 students in Figure 5 with the question "Ahmad, Beno, and Cepot must complete a project within a specified time period. Therefore, the work will be divided according to their respective abilities. Ahmad completed 3/8 parts, Beno finished 1/4 part, and Cepot completed 15/40 parts. Determine the number of parts worked by: a) Ahmad and Beno; b) Ahmad and Cepot; c) Beno and Fast ". FI-1 students begin to answer "Point A" by equating the denominator first, the results obtained are (3 + 1) / 8, in this stage FI-1 students have succeeded in equating the denominator but made a mistake in 1/8 fractions, the numerator should 2 so that the fraction is 2/8 and produces a fraction 5/8 at the end of the answer. In this problem, one mistake is seen in the technique of adding fractions. To find out the cause of the error, the following excerpts of the interview.

Researcher : try to explain the answer you are working on 3  
 FI-1 students : first I looked for LCM from the denominator of the 3/8 and 1/4 fractions, namely 8 and 4 obtained 8, the result I made the denominator so that it was obtained (3 + 1) / 8  
 Researcher : then?  
 FI-1 students : then I add the numerator, which is 3 + 1, so the result is (3 + 1) / 8  
 Researcher : why is the numerator not equated to the equivalent fraction with the denominator?  
 FI-1 students : as far as I know, Sir.  
 Researcher : 4/8 can still not be simplified?  
 FI-1 students : can still be Sir, but I don't simplify it.

Furthermore, the written results of FD-1 students (field dependent) when working on mathematical story problems in the operational material for fraction counting are given for number 3, then analyzed and conducted interviews with students to further explore the mistakes they made. The description of the FD-1 student's mistakes in solving the operational problem of fraction counting can be seen in Figure 6 below.

3 A.  $\frac{3}{8} + \frac{1}{4} = \frac{4}{12}$   
 B  $\frac{3}{8} + \frac{15}{40} = \frac{18}{40}$   
 C  $\frac{1}{4} + \frac{15}{40} = \frac{16}{40}$

Figure 6. Student Answers FD-1 in Problem Number 3

Based on the answers of FD-1 students in Figure 6 with the question "Ahmad, Beno, and Cepot must complete a project within a predetermined period. Therefore, the work will be divided according to their respective abilities. Ahmad completed 3/8 parts, Beno

finished  $\frac{1}{4}$  part, and Cepot completed  $\frac{15}{40}$  parts. Determine the number of parts worked by: a) Ahmad and Beno; b) Ahmad and Cepot; c) Beno and Fast ". FI-1 students begin to answer "Point B" by equating the denominator first, the results obtained are 40, in this stage FI-1 students have succeeded in equating the denominator but made a mistake because they immediately add the numerator  $3 + 15 = 18$  and produce fractions  $\frac{18}{40}$  at the end of the answer. In this problem, one mistake is seen in the technique of adding fractions. To find out the cause of the error, the following excerpts of the interview.

- Researcher : try to explain the answer you are working on 3  
 FI-1 students : I first looked for LCM from the denominators of the  $\frac{3}{8}$  and  $\frac{15}{40}$  fractions, which were 8 and 40 obtained 40, the results I made the denominator so that I got  $\frac{18}{40}$   
 Researcher : then?  
 FI-1 students : then I add the numerator, which is  $3 + 15$  so that the results are  $\frac{18}{40}$   
 Researcher : why is the numerator not equated to the equivalent fraction with the denominator?  
 FI-1 students : as far as I know, Sir.  
 Researcher :  $\frac{18}{40}$  can still be simplified or not?  
 FI-1 students : cannot, Sir.

## CONCLUSION

Based on exposure to the epistemological obstacle analysis that occurs in students in solving mathematical story problems based on cognitive style, several things can be summarized. The research results revealed that FI-1 students with cognitive field-independent and FD-1 students with cognitive field-dependent styles still often make misconceptions about solving math problem material in fractional counting operations. FI-1 students make a misconception because they are in a hurry to calculate or operate a fraction operation, while FD-1 students make a misconception due to a lack of understanding of the questions.

Furthermore, in procedural errors, it was revealed that FI-1 students with independent field cognitive style and FD-1 students with cognitive field-dependent styles also frequently make procedural errors in completing mathematical problem material in fractional counting operations. FI-1 students and FD-1 students made procedural mistakes because they did not fully understand the story questions given, so that there was a procedure error in solving the problem.

The technical error aspect revealed that FI-1 students with independent field cognitive style and FD-1 students with field-dependent cognitive style also often made technical mistakes in completing mathematical story problems in fraction counting operations. FI-1 students and FD-1 students made mistakes in performing the two fraction addition techniques, and this error was due to their mistake in determining the LCM from the denominator.

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