

## Profile Number Sense of 5<sup>th</sup> Grade Students Subject Based on Field-Dependent and Field-Independent Cognitive Style

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### Abstract

Number sense can vary from person to person, number sense variations can be caused by learning experiences of mathematics, mathematical abilities, and cognitive styles. This research is a qualitative descriptive study that aims to determine the number sense profile of grade V SD students in terms of the field-dependent and field-independent cognitive styles on fraction material. So the research begins by giving a math ability test, cognitive style test, and number sense test. The subjects of this study were fifth-grade students of SDN Ngagel Rejo V Surabaya with field-dependent and field-independent styles with equivalent math abilities. Data collection was continued with the number sense test, and interviews and checks using time triangulation. The results showed that students with a field-independent cognitive style tended to use logical reasoning and actively processed information and were able to simplify complex problems well. They also have a high of number sense so that they can answer and describe answers based on their analytical skills. For example, when comparing the concept of numbers, they can show that there is another fraction or decimal between two fractions or decimals. Whereas students in the field-dependent cognitive style only compare the values of the two fractions or decimals, which means they have difficulty separating and distinguishing objects. simple of complex objects. They also tend to do conventional learning such as doing multiplication using a pencil and writing on paper and cannot analyze a thing or question with an estimate or approach. Therefore, students' cognitive styles must be learned and aligned with existing teaching strategies in several schools. Teaching adjustments that are in line with students' cognitive styles are needed to improve student performance.

**Keywords:** Number Sense; Cognitive Style; Field-Dependent; Field-Independent;

## 1. Introduction

Given the importance of the role of mathematics, it is appropriate to handle the mathematics learning process properly. One of the main studies in mathematics education is the science of numbers. The level of students' mathematical abilities can be measured by knowing students' abilities in terms of number sensitivity. Underlying this preliminary study found that KTSP (2006) and Curriculum 2013 (2016) direct mathematics learning based on Number Sense.

Mathematics is not only a science of numbers and algorithms but also about the meaning of numbers. Dehaene (2001) states that: "Number is a fundamental parameter by which we make sense of the world surrounding us". One must understand numbers if they want to use numbers not only to solve maths problems but also to use them in daily life correctly.

Resnick (1989) lists 7 number sense indicators that can be used to define and assess number sense, refers to (1) Using well-know number facts to figure out facts of which one is not sure, (2) Judging whether a particular number constitutes a reasonable answer to a particular problem, (3) Approximating numerical answer (rather than calculating exact answers), (4) Using a decimal structure of the numerical system to decompose and recompose numbers to simplify calculations (especially mental calculation), (5) Tending to want to "make sense" of situations involving number and quantity, (6) Having a sense of the relative size of numbers and the quantities to which numbers refer, (7) Substituting flexibly among different possible representations of a quantity.

The meaning of the seven indicators is use facts of numbers that are generally known to find other facts, assess the answers that make sense for a particular problem, estimates numbers precisely instead of

counting, using the structure of decimal numbers to simplify calculations, tend to want a situation that makes sense related to numbers and quantities, be sensitive to the relative size of numbers, knowing the various possible representations of a number.

McIntosh, Reys, & Reys (1992) developed a number sense framework based on learning and reflection from the literature relating to the topic. Of the three main categories the number sense framework includes: knowledge of and facility with numbers, knowledge of and facility with operations, and applying knowledge of a facility with numbers and operations to computational settings; McIntosh, Bana, & Farrell (1997) made six strands (each 2 strands come from 1 main category of number sense framework).

The number sense framework can be presented into six strands, namely (1) Understanding of the meaning and size of numbers, (2) Understanding and use of equivalent representations of numbers, (3) Understanding the meaning and effect of operations, (4) Understanding and use of equivalent expressions, (5) Computing and counting strategies, (6) Measurement benchmarks (McIntosh, Bana, & Farrell, 1997). Number sense can vary in each individual, variations in number sense can be caused by mathematical learning experiences, mathematical abilities, and cognitive styles (Sengul, 2013; Chrysostomou, 2009; Yang, 2008).

Cognitive style can be used as a consideration to understand individual differences in students and use them to improve learning activities (Saracho, 1997). Cognitive style refers to specific characteristics and tendencies that a person has in processing information. A number of cognitive styles have been identified in several works of literature, for example, Witkin et al. (1977) stating that cognitive styles are differentiated into Field-Independent (FI) and Field-Dependent (FD).

This study was conducted to find out how the number sense profile or sensitivity to numbers influences the cognitive style of Field-Independent (FI) and Field-Dependent (FD) in fractional material. So that the teaching method can be adjusted to cognitive style according to the needs of students. This is expected to increase students' sensitivity or understanding of the material presented.

## **2. Materials And Methods**

This type of research is descriptive research with a qualitative approach. The purpose of this study was to be able to determine the profile number sense of fifth graders' elementary school students on fraction material based on field-dependent cognitive style, and field-independent cognitive style.

The subjects of this study were 58 students from Public Elementary School in Surabaya. The selection of subjects is done by several tests.

1. The level of mathematics ability of students is equivalent, then given a math ability test (TKM). Subjects have an equivalent level of ability if the difference in the results of the TKM is in the range 0 - 10 for the value 0 - 100.

2. *A Group Embedded Figure Test (GEFT)* test to determine student thinking outcomes, which consists of 18 questions with a score range of 0% - 50% including the field-dependent category and more than 50% to 100% including the field-independent category.

3. *Number Sense (TNS)* test consists of 4 fraction description questions which include four number sense strands. Then the interview was conducted with the aim of describing the profile number of students' senses. Based on the tests that have been conducted obtained 2 students who meet the required criteria.

## **3. Results and Discussions**

Subjects of field-dependent and field-independent, each of whom has the same level of mathematical ability with giving the exact same question. The questions given include Number Sense Strands, then both subjects answer questions with abilities and understanding analysis based on the characteristics of each subject in capturing the information provided.

Students' number sense can make a difference in dealing with problems. This means that students with different cognitive styles can have different minds when solving math problems. These differences may occur in understanding the concept of numbers, how to present, understand number operations, and strategies in calculating. Thus, the indicators are given from the indicator number component to see the student profile number indicator (McIntosh, 1992).

**Tabel 1.** Data Kognitive based on *Number Sense Strands*

Kognitive Style	
<i>Field-Dependent</i>	<i>Field-Independent</i>
Compare the values of two fractions or decimals	Indicates that there are other fractions or decimals between two fractions or decimals
Declares fractions in equivalent decimal form	Declare the fraction in another form with the example drawing a circle into several parts
Hesitantly choose a reasonable answer option without doing calculations	Can estimate answers and state the reason for the operation of the two given numbers
Cannot do mental calculations	Perform calculations to express fractions to the desired decimal form and vice versa

From the table above we can find out the difference between field-independent students and field-dependent students, the result shows that student who has a field-independent cognitive style in number concept strands not only can compare the values of two fractions or decimals but also can indicates that there are other fractions or decimals between two fractions or decimals.

An example question from Test Number Sense, student were asked the the difference between the values of the numbers 5 and 6 in numbers 26.58. Student with field-independent can answer the question, but student with field dependent cannot. Another strands namely multiple representations, student with field-dependent cognitive style little difficult to manipulate to get the solution to the mathematical expression given then easily manipulate and simplify solutions to the mathematical expressions that are given possessed by students with field-independent cognitive style. Field-independent subjects can describe mathematical expressions that are equivalent, for example  $125 \times \frac{1}{5}$  and  $125:5$  of equal value or equivalent. Strands number third, examples include recognizing that the sum of two 2-digit numbers is less than 225, that 0,99 is close to 1. For this strand, students must answer by estimating only and without calculating. The student with field-dependent argues that if the number is multiplied by 1 the result is the number itself, but the number multiplied by less than one will produce a number that is less than the initial number. Strand number fourth. The variety and complexity of the computing and counting strategies in making decisions about numbers and numerical contexts is a valuable indicator of number sense which student field-independent can estimate that with compare. So overall we knows that individuals who have a cognitive style field-independent tend to actively process information by approaching hypothesis testing, analyzing, compiling organizations, working on relevant information, being able to simplify complex problems and can easily separate and distinguish simple objects and complex objects. While individuals who are field-dependent tend to have difficulty in distinguishing stimulus through the situation faced so that perceptions of information tend to be easily influenced by manipulation of the surroundings, and difficult to separate and distinguish simple objects and complex objects (Agustan, 2012).

#### 4. Conclusion

The findings in this study, conducted on fifth graders' elementary school students on fraction material, we can find out the number sense profile between students who have the field-dependent cognitive style and students in the field-independent cognitive style. Subjects in the study were given the same information, tests, and questions, but their understanding or number sense was different due to differences in cognitive style. Cognitive style can be conceived as a choice attitude or a strategy that stably determines a person's unique way of receiving, remembering, thinking, and solving problems. So, when a student has a different cognitive style, then their way of solving problems is also different (Slameto, 2010). In addition, the definition of numbers reflects the tendency and ability to use numbers based on analysis of the data carried out for comparison between subjects who have the field-independent and field-dependent cognitive styles. Subjects who have a cognitive style field-independent show more absorbing information, using logical reasoning and more easily find solutions to problems compared to students who have a cognitive style field-dependent. It can also mean field-independent students are more successful than field-dependent counterparts in science and math since field-independent students are better than field-dependent students about distinguishing relevant clues (Witkin, 1977).

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