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RESEARCH ARTICLE

Students' Relational Thinking in Solving Word Problem Based Cognitive Style

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ABSTRACT

This study is motivated by students' low relational thinking ability. Relational thinking is one of the interesting problems in mathematics education. In this study will be examined the ability of relational thinking field-dependent and independent students in solving the arithmetic word problem. The method used in this study is qualitative descriptive. This research was conducted on 7th-grade of junior school students of Surabaya. The subjects of this study were 1 student who had a field-independent cognitive style and 1 student who had a field-dependent cognitive style. The data of the students' relational thinking process is obtained through the results of solving arithmetic word problem and interviews. Subject selection is done using instrument group embedded figures test. The results of the research showed that students with cognitive field-dependent experiences had difficulties in thinking and have not been able to establish the relationship between information elements and previous knowledge to solve problems. Whereas students with independent field cognitive styles were capable of relational thinking, namely by building interrelationships between elements of information and prior knowledge and knowledge of the properties of structure to solve problems.

1. INTRODUCTION

Humans can not be separated from the name of the problem, and one way to solve the problem is to think. Thinking is one of the important potentials that must be possessed by each individual. By thinking, individuals can build a strategy for solving everyday problems and mathematical problems. Based on the experience of the researcher while teaching in school, students often lack understanding of the problem if given a word problem. Students often cannot associate information that exists in word problems or with prior knowledge. Because of the low relational understanding of students, this also affects students' relational thinking. This means that relational thinking has an important role in helping students understand mathematical problems.

Relational thinking is very important for students (Afandi, 2018; Fonna, 2019). Molina et al (2008) states that relational thinking is important in mathematics because many basic mathematical ideas contain relations between different representations of numbers, and between other mathematical objects. Relational thinking can increase understanding of arithmetic. This is consistent with what Napaphun (2012) stated that relational thinking skills can support the development of Algebraic reasoning while improving the quality of learning and understanding of arithmetic. Arithmetic is basic arithmetic which is part of mathematics. Basic arithmetic operations are addition, subtraction, multiplication, and division.

Shoseiki (2006) states that in relational thinking, students use the properties of the counting operation, namely addition, subtraction, multiplication, and division. So, with relational thinking students are expected to be able to solve arithmetic problems in daily life and solve arithmetic word problems. Hegarty et all (1995: 18) defines arithmetic word problems as questions that contain relations statements, namely statements that show the numerical relationship between two variables.

Each student has different characteristics in processing the information provided. This is supported by Robertson (2007) which states that there are significant differences between individuals on information processing strategies that are adapted during problem-solving and decision-making activities. When there are differences in information processing, the way students respond to information that is confronted with them will also be different. The difference between students in compiling and processing information is known as cognitive style. Messick defines cognitive style as a stable attitude or habitual strategy that determines the style or way of an individual in accepting, remembering, and solving problems (Kozhevnikov, 2007, p. 464; Kurniawan, 2018; Wulandari, 2019). The same thing stated by Liu and Ginther (1999) states that cognitive style refers to consistency and tendency of individual characteristics to feel, remember, organize, process, think and solve problems.

There are many types of cognitive styles that are expressed. Woolfolk and Margetts (2010) distinguish cognitive styles more specifically in relation to the teaching and learning process, including: (a) independent field-dependent fields, (b) exclusive-reflective, and (c) verbal imagery-nonverbal imagery. Of the many types of cognitive styles expressed, field independent field-dependent cognitive styles will be the focus of this study. The

dimensions of the cognitive field independent and field dependent styles have been studied by many researchers and related to the learning process. Keefe acknowledges that field independent cognitive style and field dependent appear to be the most potential in increasing educational experience (Woodridge, 2006; Amalia, 2018; Simanjuntak, 2019; Winarso, 2018).

Previous research examined relational thinking in terms of gender. Baiduri (2014) in his research said that the relationships carried out by male students were richer than female students, meaning that male students were more often thinking relationally than female students. there are no studies that examine students' relational thinking in terms of the field-independent and field-dependent cognitive styles. Based on the description above, researchers are interested in conducting research to describe students' relational thinking skills in solving social arithmetic questions in terms of cognitive style.

2. RESEARCH METHOD

The research method used is a qualitative method with a type of descriptive research. This research was conducted on 7th grade students of State Junior High School 49 Surabaya. The instruments in this study consisted of the Group Embedded Figures Test (GEFT), Mathematics Ability Test (TKM), and Arithmetic Word Problem (SCA). To determine the subject, all classes are given GEFT and TKM. GEFT was given to obtain data on student groups with dependent field cognitive styles and independent fields. After getting the cognitive style group, the TKM results were used to select one subject from each cognitive style group who had the appropriate mathematical abilities. So the subject of this study was 1 student who had an independent cognitive style field with moderate mathematical abilities and 1 student who had a dependent cognitive style with moderate mathematical abilities. Subjects were collected to complete the SCA and SCA-based interviews were held. The technique of receiving data uses written tests and interviews based on tests. Data analysis is done with; organizing information obtained; read the entire information and make a classification; make a detailed description of the matter which then arises from the results of the test; determine patterns and look for relationships between several categories; do interpretation, and ; presents narratively.

3. RESULT AND DISCUSSION

The arithmetic word problem given by researchers can be seen in Figure 1.

> Di sebuah sekolah akan dibangun beberapa ruang kelas baru. Pembangunan diperkirakan dapat selesai dalam waktu 140 hari dengan 9 orang pekerja. Setelah 20 hari kerja, seorang pekerja sakit sehingga ia tidak dapat melanjutkan pekerjaan. Jika kemampuan pekerja relatif sama, berapa hari selisih waktu penyelesaian pembangunan dari waktu yang diperkirakan ?.
>
> In school, some new classrooms will be built. Development is expected to be completed in 140 days with 9 workers. After 20 working days, a worker is sick so he cannot continue work. If the ability of workers is relatively the same, how many days is the difference in time to complete construction from the estimated time?

Figure 1. The Arithmetic Word Problem

The results of completion of field independent students can be seen in Figure 1. In figure 1 above shows that field independent students are able to think relationally in understanding the analogy between information or building interrelationships between elements of information and with prior knowledge and knowledge of the properties or structure of mathematics and applying mathematical rules in solving problems. This is supported by the results of interviews of students who stated that "the value of 120 days × 9 workers will be equal to the value. . . days × 8 workers, just keep counting ". This is consistent with what Molina (2008) said that relational thinking is associated with many different relationships that children do in recognizing, building relationships between and within numbers, expressions, and operations. This means that relational thinking involves the use of the basic nature of operations and similarities to analyze problems in the context of the objective structure and then simplify the problem towards that goal.

Unlike field dependent students who have difficulty in relational thinking. The results of completion of field independent students can be seen in Figure 2.

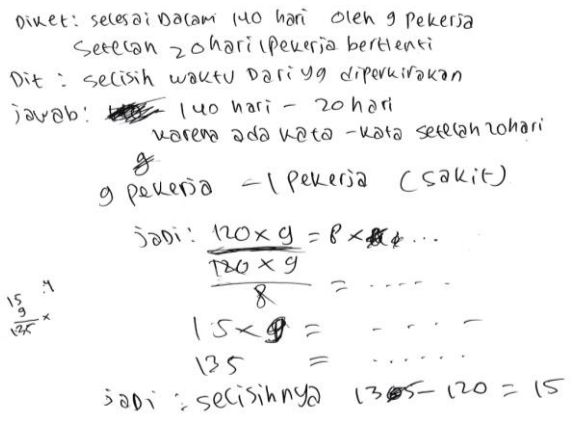

Figure 2. The Results of Completion of Field Independent Students

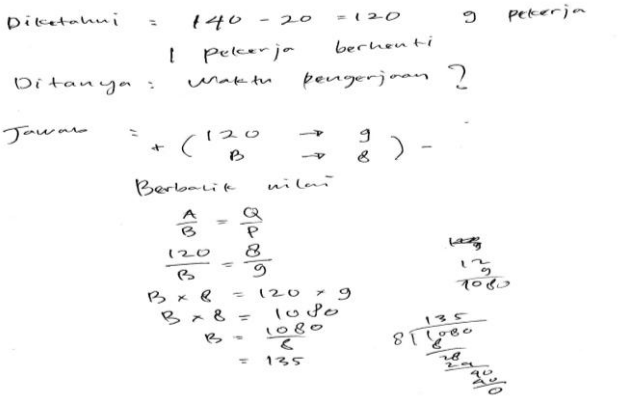

Figure 3. The Results of Completion of Field Independent Students

Field-dependent students have difficulty in building interrelationships between the elements of information provided. This is corroborated by the results of student interviews stating that students are easier to answer using a reverse value without knowi ng the concept. The student acknowledges that he only applies the procedures he knows without knowing the reason why the procedure was used. Field dependent subject uses a formula that

he knows, namely A divided by B equals P divided by Q. Dependent field subjects do not know where the formula was obtained and do not know the reason why B x 8 = 120 x 9. This shows that students are less able to think relationally. According to Hejny, Jirotkova & Kratochviova (2006), the main difference between relational thinking and not relational thinking is that those who do not think relationally are based on activating some procedures in their minds after identifying problems, while students think rationally, students create a picture problems in his mind as a whole, analyzing to find the core structure, and looking for some important elements or relations to build a settlement strategy.

Through the description of the results of students' work in solving arithmetic word problems, it has been seen that independent field students can solve problems by relational thinking, while field dependent students have difficulties and cannot think relationally despite being able to solve the problem given.

4. CONCLUSION

From the results of research on 7th grade students in 49 junior high schools in Surabaya, researchers can conclude that field dependent students still have difficulty in relational thinking in solving arithmetic word problems. This is because students are accustomed to procedural mathematical calculations. So that students in solving problems fixate on the usual procedures and become a standard way that mathematical questions must be solved by a certain calculation. Through this research, it appears that field dependent students are less capable of relational thinking in using knowledge of traits, structures, operations in mathematics to solve arithmetic problems. Whereas for independent field students can solve problems by building interrelationships between elements of information and with prior knowledge and knowledge of the properties and elements of mathematics.

Based on the results of this study, it is expected that further in-depth research can be developed, especially in the development of students' relational thinking processes, especially in arithmetic and algebraic material, wherein solving algebraic problems students are very fixated by the procedures are given by the teacher and those listed in the book. In learning mathematics, students often find it difficult to capture material, this is indicated because students get less meaningful learning, therefore teachers are expected to be able to direct students to learn mathematics with real problems. By completing/analyzing real problems students will feel learning is more meaningful because with real problems students will be faced with problems that describe the actual situation in everyday life so that students have a real picture/purpose in learning mathematics.

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