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Preface

Dear all ICERD participants, welcome to Surabaya, Indonesia. Welcome also to Universitas Negeri Surabaya. We are very glad to have you all, to participate in this conference.

In celebrating its 51st anniversary, The State University of Surabaya/Universitas Negeri Surabaya, proudly presents "The 2015 Internasional Conference on Educational Research and Development". The conference is conduction to bring together diversed ideas of researchers, educators, lecturers, teachers, students, and those who have interests in research on education and its development as well as on science and technology.

We are very honored to have Prof. Dr. Muhammad Nuh, DEA (former Republic of Indonesia Minister of Education and Culture, 2009 – 2014), Prof. Dr. Muchlas Samani (Universitas Negeri Surabaya, Indonesia), Prof. Dr. Fou-Lai Lin (National Taiwan Normal University), Prof. Dr. Bill Atweh (Adjunct Professor of Curtin University, Australia, and visiting Professor at Philippines Normal Univesity), and Prof. Dato' Abdul Rahman B. Abdul Aziz, Ph.D (Universiti Utara Malaysia), and Dr. Zeny Reyes (Philippines Normal University) as keynote and plenary speakers.

To all our sponsors for this conference, Bank Tabungan Negara (Universitas Negeri Surabaya branch) and Telkom Divre 5 Surabaya, our thanks are also for you.

On behalf of the Organizing Committee and Steering Committee, I wish you all a blessed and productive time in our ICERD conference. God bless you all.

December 1, 2015
Surabaya

Arie Wardhono

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Table of Contents

ANALYSIS ON THE ABILITY OF ELEMENTARY SCHOOL STUDENT WHO HAD HIGH MATHEMATICS ABILITY IN MAKING THE EQUATION OF FRACTIONS

Syarifatul Maf'ulah [1], Dwi Juniati [2], Tatag Yuli Eko Siswono [2]

[1]STKIP PGRI Jombang,
syarifatul.m@gmail.com

[2]UNIVERSITAS NEGERI SURABAYA
(dwi_juniati@yahoo.com,, tatagyes@yahoo.com)

ABSTRACT

The purpose of this study was to analyze the ability of fifth grade elementary school student who had high mathematic ability in making the equation of fractions. This kind of research was qualitative by a student subject. Data collection was conducted by giving a test to the subject, continued by interviews. The next stage was data analysis, include reduce the data, presentate the data, conclusion and verificate the data. Subject was given a test containing an equation $\frac{4}{5} - a = \frac{1}{4}$ as initial equation. Then, subject was asked to make an another equation as equivalent as initial one as much as possible. The result test indicated that subject able to make the eleven equations correctly. The following steps were (1) subject changed the initial equation element position; (2) subject refered on $\frac{4}{5} - \frac{1}{4} = a$, then changed both elements known to the another equivalent fraction; (3) subject changed the operan known at initial equation to the another equivalent fraction without changed the position of elements at initial equation ; (4) subject refered on $a + \frac{1}{4} = \frac{4}{5}$, then changed both elements known to the another equivalent fraction; (5) subject changed the element position from initial equation, then added both elements with an element or an a.

Keywords: analysis, ability to make equation, fraction

I. INTRODUCTION

The research is inspired by Piaget's theory of reversibility. Reversibility means the person mental ability to change the mind purpose to the original point (Piaget via Slavin, 2008: 48). While (Krutetskii, 1976: 287) explains that reversibility is the person thinking to build up the reversible sides. Furthermore, Krutetskii identifies one of the categorized mathematics ability related to success in solving the problem, it is reversibility. On the other hand, student mathematics ability has the role in solving mathematical problem. It means that reversibility affects the student ability to solve the problem. Whereas problem solving is the learning mathematics focused. This is constructed by NCTM (2000: 52) that expands problem solving is the integral part of learning matematics. It is relevant with Soedjadi (1992: 33) states mathematics should be directed to develop the student future live transferable ability.

Reversibility is the person thinking ability to build up the reversible sides. It means that reversibility has two reversible ways, they are beginning side to the final one as the reached goal, and the final side returns to the beginning one. However, research focussed is how the student thinking ability from the beginning side to the final. The beginning side is the first equation test given. Then, subject asked to make many equations as equivalent as the beginning one. So the equation student made means the rearched goal.

The defined equation related to fractions and arithmetic operations. Fractons is on of the pre-requisites for understanding the subsequent and the intertwined materials of fractions concept. If student do not understand the basic, student will difficulty in studying further. Research subject is the fifth grade of elementary school student by considering the fractions is the first time material given at elementary school. In addition, Piaget states the ability of buiding the two-way relation develop in concrete operastional stage, it is about 7 to 11 years old. It means reversibility begins on elementary school student. But focus of research subject is student who had high mathematics by considering the result of research is used as basic by the teacher to teach fractions and arithmetic operations. In expectation is the ability the other student can be same or equal with ability of student who had high mathematics especially fraction and arithmatics operation materials. Based on the descriptions, researcher interested analyzing the elementary student ability in making fractions.

II. RESEARCH METHOD

Research Design

This study purposed analyzing the elementary school student ability in making fractions. Therefore, this is a descriptive qualitative research. Researcher gave a test to the subject, then researcher conducted interview to the suject for comprehending about the things of uncovered test yet. Furthermore, the result data analyzed based on the framework established in theoritical study.

Research Subject

Research subject was the fifth grade of elemetary school student who is capable in high mathematic. High mathematic information was obtained by mathematic test and consultation with the teacher

Research Instrument

The main instrument is the researcher herself. While supporting instrument are as follows:

1. Test used to obtain the data about subject's ability delineation in making equation. A test contains an equation then subject was asked to make as many as another equivalent equation.
2. Interview guideline in this study is semi-structured or opened. Subject was interviewed based on the work result

Research Procedure

Research procedure consists of three stages described by following:

1. Preparation Stage

   The research preparation stage examines theory in making equation's ability refers to part of reversibility characteristic.

2. Implementation Stage

   The research implementation stage selectes the subject. Furthermore, researcher give a test to the subject, then followed by interviewed based on the work resullt.

3. Analysis Stage

   The research analysis stage analyzes the data and report writing.

Data Analysis Technique

Result data was analyzed with references to (i) the equation subject made number (ii) subject's way in making each the beginning equivalent equation. Analysis conducted after finishing the interview. Then data analysis conducted by following step: (1) data reduction; (2) data exploring; (3) drawing conclusion.

III. RESULT AND DISCUSSION

Before research was conducted, researcher choose the subject previously, it is fifth grade of elementary student of MIN Kauman Jombang. Furthermore, researcher conduted the research and analyzed the result data

Data Analysis Finding and Discussion

1. Test result

A test was given by the researcher such as the following:

TEST (30 minutes)
Given the following form:
Form: "$\frac{4}{5} - a = \frac{1}{4}$"
Rewrite the above from to the
"another similar form" as much as possible

Fig. 1. Test Instrument

The followings are the the result subject in making the equation

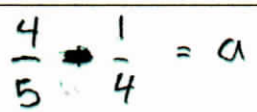
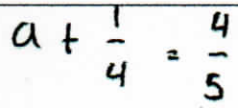
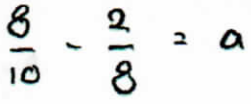
Table 1 : Subject Equation Made

Equation Code	Subject Equation Made
P1	$\frac{4}{5} \rightarrow \frac{1}{4} = a$
P2	$a + \frac{1}{4} = \frac{4}{5}$
P3	$\frac{8}{10} - \frac{2}{8} = a$
P4	$\frac{8}{10} - a = \frac{1}{4}$
P5	$\frac{4}{5} - \frac{2}{8} = a$
P6	$a + \frac{3}{12} = \frac{8}{10}$
P7	$\frac{1}{4} + \frac{1}{4} + a - \frac{4}{5} = \frac{1}{4}$
P8	$\frac{4}{5} - a - \frac{1}{4} + a = a$
P9	$\frac{1}{4} + \frac{4}{5} = \frac{4}{5} - a + \frac{4}{5}$
P10	$\frac{4}{5} + a = a + a + \frac{1}{4}$
P11	$\frac{1}{4} + a = \frac{4}{5}$

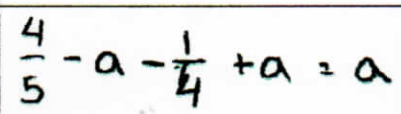
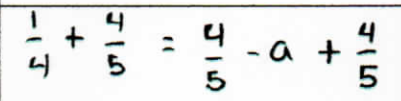
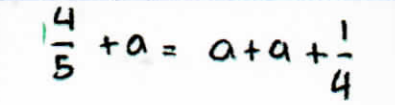
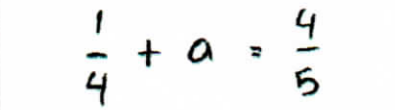
Based on the test result, known the subject has made 10 the beginning equivalent equation.

While subject way in making the beginning equivalent equation was obtained from interview. The followings are the subject way in making each equation

Table 2: Subject Way in Making Each Equation

Equation Code	Equation Subject Made	Equation Making Way
P1		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$ subject made P1 by moving $\frac{1}{4}$ elements to the right side and moving a to left side, obtained $\frac{4}{5} - \frac{1}{4} = a$ as P1
P2		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P2 by moving a side. It should be obtained $\frac{4}{5} = \frac{1}{4} + a$, but subject wrote in $a + \frac{1}{4} = \frac{4}{5}$ form by reasoning there were an equal sign "=", so $\frac{4}{5} = \frac{1}{4} + a = a + \frac{1}{4} = \frac{4}{5}$. Thus, obtained $a + \frac{1}{4} = \frac{4}{5}$ as P2.
P3		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P3 in reference to P1, it was $\frac{4}{5} - \frac{1}{4} = a$ because of the beginning equation made. Then subject changed both of known elements on $\frac{4}{5} - \frac{1}{4} = a$ to an another equivalent fraction. It changed $\frac{4}{5}$ into $\frac{8}{10}$ and $\frac{1}{4}$ into $\frac{2}{8}$ obtained $\frac{8}{10} - \frac{2}{8} = a$ as P3

P4	$\frac{8}{10} - a = \frac{1}{4}$	The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P4 by changing the side knowed on beginning equation to an another equivalent fraction. It changed $\frac{4}{5}$ as $\frac{8}{10}$ obtained $\frac{8}{10} - a = \frac{1}{4}$ as P4
P5	$\frac{4}{5} - \frac{2}{8} = a$	The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P5 in reference on P1, it was $\frac{4}{5} - \frac{1}{4} = a$ by reasoning P1 the beginning equation made. Then subject changed one of the element known by $\frac{4}{5} - \frac{1}{4} = a$ into an another equivalent fraction. It changed $\frac{1}{4}$ into $\frac{2}{8}$ obtained $\frac{4}{5} - \frac{2}{8} = a$ as P5.
P6	$a + \frac{3}{12} = \frac{8}{10}$	The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P6 in reference on P2, it was $a + \frac{1}{4} = \frac{4}{5}$. Then it changed both of elements known by P2 into anan another equivalent fraction. It changed $\frac{4}{5}$ into $\frac{8}{10}$ and changed $\frac{1}{4}$ into $\frac{3}{12}$ obtained $a + \frac{3}{12} = \frac{8}{10}$ as P6.
P7	$\frac{1}{4} + \frac{1}{4} + a - \frac{4}{5} = \frac{1}{4}$	The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P7 by moving the a and $\frac{4}{5}$ side, obtained $0 = \frac{1}{4} + a - \frac{4}{5}$. Then added the

		sides of $0 = \frac{1}{4} + a - \frac{4}{5}$ with $\frac{1}{4}$. Obtained $\frac{1}{4} = \frac{1}{4} + a - \frac{4}{5} + \frac{1}{4}$, but subject wrote $\frac{1}{4} + a - \frac{4}{5} + \frac{1}{4}, = \frac{1}{4}$ as P7
P8		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made by moving the $\frac{1}{4}$ side, obtained $\frac{4}{5} - a - \frac{1}{4} = 0$. Then added the sides of $\frac{4}{5} - a - \frac{1}{4} = 0$ with a, obtained $\frac{4}{5} - a - \frac{1}{4} + a = a$ as P8.
P9		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P9 by changing $\frac{4}{5} - a = \frac{1}{4}$ form into $\frac{1}{4} = \frac{4}{5} - a$ by reasoning there was an equal sign "=", so $\frac{4}{5} - a = \frac{1}{4}$ same as $\frac{1}{4} = \frac{4}{5} - a$. Then added the sides of $\frac{1}{4} = \frac{4}{5} - a$ with $\frac{4}{5}$, obtained $\frac{1}{4} + \frac{4}{5} = \frac{4}{5} - a + \frac{4}{5}$ as P9
P10		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P10 by moving the a side, obtained $\frac{4}{5} = a + \frac{1}{4}$. Then operated the sides of $\frac{4}{5} = a + \frac{1}{4}$ with a, obtained $\frac{4}{5} + a = a + a + \frac{1}{4}$ as P10
P11		The beginning equation was $\frac{4}{5} - a = \frac{1}{4}$. Subject made P10 by moving the a side. It sholud be

		obtained $\frac{4}{5} = \frac{1}{4} + a$, but subject wrote $\frac{1}{4} + a = \frac{4}{5}$ form as P11

Based on the table 2 above, obtained the descriptions of subject way in making the equation of fractions

1. Subject made a new equation by the changing the side on beginning equation without changing these element to an another equivalent equation. At this category divided by two, they were as follows
   a. Moving the $\frac{1}{4}$ andaelements side

      The test beginning equation given was $\frac{4}{5} - a = \frac{1}{4}$. Subject made a new equation by moving the $\frac{1}{4}$ of right side and moving the a of left side. The subject equation made included P1 category was $\frac{4}{5} - \frac{1}{4} = a$.

   b. Moving the aelement side

      A test beginning equation given was $\frac{4}{5} - a = \frac{1}{4}$. Subject made a new equation by moving the a element. The subject equation made included P2 category was $\frac{1}{4} + a = \frac{4}{5}$, and P11 category was $a + \frac{1}{4} = \frac{4}{5}$. But P11, subject also used the commutative to arithmetic, it was $\frac{1}{4} + a = a + \frac{1}{4}$.

2. Subject made a new equation in referenceon P1, it was $\frac{4}{5} - \frac{1}{4} = a$ by reasoning P1 made from the beginning equation. Then, subject changed the known sides of $\frac{4}{5} - \frac{1}{4} = a$ to an another equivalent equation. The subject equation made included P3 category was $\frac{8}{10} - \frac{2}{8} = a$ and P5 category was $\frac{4}{5} - \frac{2}{8} = a$.
3. Subject made a new equation by changing the known side on beginning equation to an another equivalent equation. The subject equation made included P4 category was $\frac{8}{10} - a = \frac{1}{4}$.
4. Subject made a new equation in reference on P2, it was $a + \frac{1}{4} = \frac{4}{5}$.Then, changed the known sides on P2 to an another equivalent equation. The subject equation made included P6 category $a + \frac{3}{12} = \frac{8}{10}$.

5. Subject made a new equation by moving the side of beginning equation, then added the sides with the fractions. These category divided by two parts, they are as follows
   a. Moving the one of beginning equation element then added those sides by fractions, the included category of equation was P8 $\frac{4}{5} - a - \frac{1}{4} + a = a$ and P10 $\frac{4}{5} + a = a + a + \frac{1}{4}$.
   b. Moving the beginning equation side elements then added those sides by fractions, the included category of equation was P7 $\frac{1}{4} + a - \frac{4}{5} + \frac{1}{4} = \frac{1}{4}$.
6. Subject made a new equation by moving one of these then added the sides by the fractions. The included category of equation was $\frac{1}{4} + \frac{4}{5} = \frac{4}{5} - a + \frac{4}{5}$.

IV. CONCLUSION

Based on the result analysis obtained the conclusion about subject ability in making of equation. It was a subject making the eleven equivalent equations $\frac{4}{5} - a = \frac{1}{4}$. The subject way in making the beginning equivalent equation as follows

1. Subject only moved the beginning equation of element side.
2. Subject referenced at $\frac{4}{5} - \frac{1}{4} = a$, then changed the known elements at $\frac{4}{5} - \frac{1}{4} = a$ to an another equivalent fractions
3. Subject changed the known position on beginning equation to an another equivalent fractions
4. Subject referenced at $a + \frac{1}{4} = \frac{4}{5}$,then changed the known sides on $a + \frac{1}{4} = \frac{4}{5}$ to an another equivalent fractions
5. Subject moved the sides of beginning equation, then added the sides by fractions
6. Subject moved one of the beginning equation sides then added those equation sides by the fractions

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