Student’s Multiple Representation in Solving Addition and Subtraction of Fraction Problem

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Abstract. Fraction is one of mathematics’ topics that difficult to be understood. Many representation form from fraction. Representation has an important role in mathematic. Representation helps student to create mathematic ideas more concrete. So, multi-representation is needed in fractional problem solving. This study is to describe students’ ability of multi-representation in solving fraction problem. The sample of this study is the VII-B grade students of a state junior high school in Munjungan city, East Java. There are eight classes from A to H, VII-B was chosen purposively. There were 10 boys and 12 girls in VII-B. Multi-representation test was given to each student. Three volunteer were chosen as our respondents. The semi-structured interview was utilized to investigate the process and students conceptual of fraction. This study shows that the students still have difficulties to represent fraction. The students were success to solve model representation, but they have difficulty to solve fraction in number line. The error in representation on addition and subtraction of fraction problem shows that student did not understand fraction concept well. Student ability on multi-representations should be conducted through exercise continually.

1. Introduction

Representation was important for student. Representation was one of fifth standard process in mathematics school [1]. Representation could be described the process of modelling the real world to abstract concept or symbol [2]. Representation was needed in problem solving [3]. Representation made mathematics idea more concrete and constructed the understanding; communicated information and reasoning [4]. Representation consisted of visual, verbal and symbolic. Visual representation presented such us picture, number line, and other mathematics picture. Verbal representation presented such us sentence or word problem. Symbolic representation presented such us number or other symbol [2].

Fraction was important in algebraic and other mathematics topic [5]. Fraction was subject material on seventh grade [6]. Therefore, fraction should be mastered by student. There were seven types of representations in fractional concepts: (1) part group; (2) part-whole; (3) part group non-congruent part; (4) part group comparison; (5) number line; (6) part whole, comparison; (7) part whole, non-congruent part [7].

Student of elementary school were difficult to make representation in addition and subtraction of number line [8]. Student of elementary school were difficult to divide the number line into required denominator [8]. The use pictorial models or model representation help student to develop the visualization skills [9]. But, there were student unable to represent symbolic to pictorial or model [10]. The students still have difficulties in the representation of fraction problem especially in pictorial or
In model representation, mistakes were found in the denominator and numerator determination of addition operation [8]. Based on the previous research, student failed to represent fraction such as number line and pictorial. Because the representation was important on problem solving, the representation should be mastered by student well. In this study describe about addition and subtraction on number line and model representation in junior high school.

2. Methods
This was qualitative research which aims of this study to describe the students’ ability when create each representation in fraction. This study conducted in state junior high school in Munjungan city, East Java. The sample of this study is VII-B, selected from eight classes and chosen purposively. The class consist of 10 boys and 12 girls. Multi-representation test were given to student. The test about addition and subtraction on fraction. This study only discussed about number line and model representation. Multiple representation tests were given to all students. In this research use semi-structured interview. Three students were volunteer to be interviewed to get detail explanation from their answer.

There were 3 questions about about fraction. The criteria of multi representation were measured from the Table 1 (Adapted from [8]).

| Representation | Number line | Model |
|----------------|-------------|-------|
| 1. Draw the number line | 1. Determine the denominator (draw closed figure or picture divided to equal parts) | |
| 2. Determine the denominator (divide equal parts) | 2. Determine the numerator (mark requested part) | |
| 3. Show numerator with arrows | 3. Perform the operation | |
| 4. Perform the operation | 4. Show the result | |
| 5. Show the result | | |

This was the fraction problem:
1. Use number line to get the answer of $\frac{3}{16} + \frac{6}{16}$
2. Use model to get answer of $\frac{6}{12} + \frac{1}{6}$
3. Use number line to get answer of $1 \frac{1}{2} - \frac{3}{4}$
4. Use model to get answer of $\frac{8}{14} - \frac{1}{7}$

3. Results and Discussion
The multiple representation test was analyzed based on criteria table 1. The test only discuss about addition and subtraction on number line and model representation.

3.1. Answer by Student 1

![Figure 1. Addition number line]
Student 1 was able to create the number line correctly. It shown by determine the denominator by divide line with the equal parts. Student showed the arrow to express the numerator. But, Student 1 didn’t show the final result by arrowing out the result.

Q : You have answered with the number. Please, do it in number line.
S1 : Yes, mam (students draw the number line and use arrow to show the numerator)
Q : Are you sure ? Show the result. Be careful with the order.
S1 : Yes mam.

![Figure 2. Addition model](image)

Student 1 have drawn the drawing closed figure. Student 1 divided picture with 12 equal parts that show the denominator. Student 1 didn’t draw the picture well. From interview Student 1 know that 12 is denominator with same equal parts. Student 1 marked the numerator with concise. Student 1 answer it right and well.

![Figure 3. Subtraction number line](image)

Student 1 draw the line well. divide it become 14 part but the denominator were 4 not 14. Student 1 showed the numerator by arrow. Student 1 didn’t show the result because there is no arrow out. The result was wrong.

![Figure 4. Subtraction on model](image)

Student 1 draw the picture with 14 equal part. Student 1 mark the numerator. Student 1 got right answer.

Q : What did you draw ?
S1 : I draw the picture that represent the fraction.
Q : What did the mark mean on your picture ?
S1 : The mark showed the numerator and the blank show the denominator.
3.2 Answer by Student 2

![Figure 5](image_url)  
**Figure 5.** Addition on number line.  
Student 2 draw the number line. Student 2 show the numerator by arrow with right direction. Student 2 was not show the result by arrow. There was no final result.

![Figure 6](image_url)  
**Figure 6.** Addition on model.  
Student 2 draw closed figure. Student 2 divide the figure become equal part. Student 2 mark the numerator then get right answer.  
Student 2 didn’t answer the question about subtraction on number line. From interview, Student 2 confused to draw the line and divide it. Confused to show the numerator and result.

![Figure 7](image_url)  
**Figure 7.** Subtraction on model.  
Student 2 draw the closed figure. Student 2 showed the denominator by divide it become 14 equal part although not draw it well. Student 2 showed the result of the operation well.

3.3 Answer by Student 3

![Figure 8](image_url)  
**Figure 8.** Addition on number line.
Student 3 draw the number line. Student 3 show the denominator by divide the line become 16 part but not placing the integers or number. Student 3 didn’t show the numerator well because only show one fraction. Student 3 did not show the result well by arrow out.

![Figure 9. Addition on model.](image)

Student 3 draw the picture well. Student 3 divide it became 12 equal part as denominator. Student 3 mark the numerator by concise. Student 3 got right answer on model representation.

![Figure 10. Subtraction on number line.](image)

Student 3 draw the number line well. Student 3 did not place the number completely and well. Student 3 did not show the denominator and numerator well by arrow. Student 3 did not show the result well on number line by arrow.

![Figure 11. Subtraction on model](image)

Student 3 draw the closed figure. Student 3 divide it become 14 equal parts to show the denominator. Student 3 mark the numerator well. Student 3 got the answer well.

Q : “How did you get the answer ?”
S3 : “First, i draw the figure, then divide the first picture in 14 equal part. Then i did the same on the second picture, i make the same denominator which is 14.”
Q : “After that what is your step?”
S3 :“The last step is subtract the first picture by second picture and get the answer is the third picture”. The result from students 3 was contra from the result from research [11] which is the student failed to represent the picture or model.

4. Conclusion
Based on the analysis of the results of the above data obtained from the pre-test, post-test, and Based on the result and discussion, student did well on model representation on addition and subtraction. Student 1 did well on the model representation in addition and subtraction. But student 1 still have difficulty on
number line in addition and subtraction. Student 1 confused to show the final result and denominator well. Student 2 did well on model representation both addition and subtraction. Student 2 did not answer the number line representation. It seems student 2 is confused and feel difficult to answer. Student 3 did well on solving model representation both addition and subtraction. Student 3 did not show the final number line well. The conclusion, they draw the closed figure and show the result well. Students still have difficulties on show the result on number line representation. There was student not answer the question. Almost student did not show the result well because not arrow out the final result. So, students still confused about fraction concept. Teacher should explain more about the concept of fraction and gave the exercise on any figure or multiple representations. Because representation will help the student in problem solving.

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