

**THE STUDY OF INTEGERS AND FRACTION IN THE MATHEMATICS
BOOK 7TH GRADE IN CURRICULUM 2013 AND THE LEARNING
MEDIA USED**

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Abstract

The implementation of curriculum 2013 insists teachers to be creative in teaching. One of the things that must be done is preparing learning equipment including learning aids, so the learning objective can be reached. Students book or teacher book have been prepared by the government, but the teacher must be critical to the book and critical in preparing the media needed. This article aims at analyzing critically the material of integers and fraction in student book 7th grade curriculum 2013 and discussing the appropriate learning aids. The materials of integers include addition, reduction or subtraction, and multiplication, mainly on negative integers, while the materials of fraction include addition, subtraction, multiplication, and fraction division. The learning aids discussed in this study cover: paired card media, number line block, number line straw, equality of ratio number dominoes and fraction strip.

Key words: integers, fraction, learning aids

Introduction

One of the competencies that must be owned by teachers based on the regulation of national education minister the Republic of Indonesia No 16 year 2007 is pedagogical competence. In this competence, a teacher is demanded to implement various approaches, strategies, methods, and learning techniques that educate creatively in the lesson they teach. Teachers also have to use learning aids and learning source that are relevant with the characteristics of the students and with the lesson taught to reach the objective fully. To do all of them, various learning sources and learning aids need to be prepared.

One of the the learning sources that has been prepared by the government is mathematics text book of Junior High School class 7. However, teachers must be still critical in using the book so there is compatibility among the material, the characteristics of the students, and the learning aids used, so the objective of learning can be reached. Marshall & Paul (2008) states that teachers' own knowledge of the mathematics, the children and the manipulatives need to be sufficient so as they can assist children to connect the use of the manipulatives to the concept being developed. Thus, this study analyzes the material of integers and fraction in the mathematics text book of Junior High School class 7 semester 1 in curriculum 2013.

After analyzing the material that will be taught, the teacher must prepare the learning aids well. The students' characteristics have also to be paid attention. Based on Bruner's theory, in iconic stage, the concept implant to the students must be through a manipulative media, so the mathematics concept can be understood well. Boggan, Harper & Whitmire (2010), states that students at all levels and of all abilities can benefit from manipulatives. Thus, this writing will discuss about the learning media that is appropriate with the material of integers and fraction.

Based on the theory of Piaget about development, the students with the age less than 12 until 15 years old, their intellectual development is in the stage of concrete operations because how they think is based on the physical and objects manipulation. The characteristic of concrete operations stage is that there is an operation system based on the concrete things. In other

words, the use of media (including learning aid) in learning mathematics is really needed because it is suitable with how the children think. Learning aid can be made from the simple things around us. Siemon (2009) states that implanting knowledge is begun with the small and simple things to be able to get good results. Learning aid can also make students active in learning. According to Thompson (1994), concrete materials enable you and your students to have grounded conversations. Besides, concrete materials provide something on which students can act.

Learning media in mathematics lesson is meant to make useful learning, easily understood by the students, and make the students learn suitable with the learning objective. This writing is hoped as a consideration to teach the junior high school students in 7th grade.

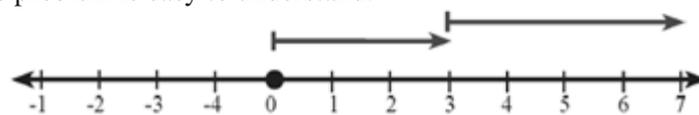
The study of integers and Fraction in the Mathematics Book 7th Grade in Curriculum 2013

Numbers are the topic of mathematics that is first taught to the students in elementary school. In the next class, students will know numbers with more numbers and know fraction. The importance of students' comprehension about numbers and the application is seemed from the material of rational numbers presented in the mathematics content standard of SMP/MTs. At SMP/MTs, learning rational numbers includes positive integers, negative integers and fraction. Based on the standard of curriculum content, the competence standard of rational numbers at 7th grade is understanding the characteristics of numbers calculation operation and use in problem solving and the basic competence is doing round numbers calculation operation and fraction and use the characteristics of integers calculation operation and fraction in problem solving.

Integers

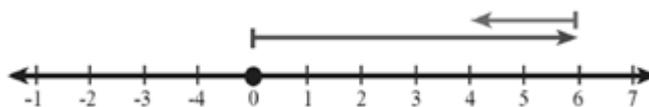
Based on the research result done by Imelda, et al (2014) some kinds of mistakes made by the students that relate to the concept of integers mixed calculation operation are : (1) the mistake in deciding the result of addition operation and subtraction of two integers that have the same negative signs and different signs, (2) carelessness in answering an exercise or a problem like the mistake in rewriting the exercise, the mistake in writing an answer, the mistake in writing signs of calculation operation, and the mistake in placing the next result of calculation operation that will be operated again, (3) the mistake relating with understanding the calculation operation problem of mixed integers that is the mistake in deciding the step in solving the problem. Based on the research above, the materials that have not been the problems for the students are not analyzed in this writing.

The material of integers in student book of junior high school of 7th grade semester 1 includes comparing integers, adding and subtracting integers, multiplying and dividing integers, multiple and integers factor, and understanding the numbers pattern. In the material of adding and subtracting integers, something that needs to be paid attention is when the material is subtracting negative numbers. Pay attention on picture 1 taken from picture 1.5 page 10. The illustration for this problem is easy to understand.



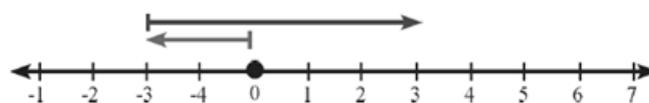
Picture 1 Addition 3+4 (Asari,2014:10)

The problem will appear when the students understand the subtraction of negative numbers. In picture 2, it is seen that for subtraction $6 - 2$, the arrow goes to the right until number 6. Then because of subtraction, it turns back 2 to the left. The problem will appear if it is $-6 - 2$. The book explains that if the number subtracted turns back, but it does not explain that the direction is already to the left.



Picture 2 Subtraction $6 - 2$ (Asari,2014:10)

The problem still makes a question for the students how about the case of negative numbers subtraction like picture 3. The picture shows the process of subtraction $-2 - (-5)$. The picture shows that the process of negative numbers subtraction turns to right. The students have not been guided to understand that the subtraction of negative numbers is the same as that in addition.



Picture 3 subtraction $-2 - (-5)$ (Asari,2014:11)

For integers multiplication, the material that is difficult to be understood by the students is multiplication that includes negative numbers, like multiplication between negative numbers and negative numbers. However, in the book, the guidance to understand that the result of multiplication between two negative numbers is positive is still less. It is also shown in table 1.6 page 22 like in table 1. This table only makes the students memorize the pattern, without knowing how the pattern is formed.

Table1. Multiplication of two non zero integers (Asari,2014:22)

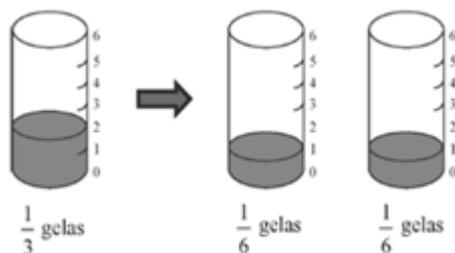
Bilangan I		Bilangan II		Hasil
Positif (+)	×	Positif (+)	=	Positif (+)
Positif (+)	×	Negatif (-)	=	Negatif (-)
Negatif (-)	×	Positif (+)	=	Negatif (-)
Negatif (-)	×	Negatif (-)	=	Positif (+)

Fraction

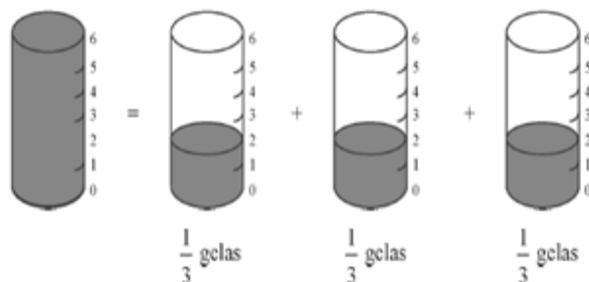
Fraction is sub part of numbers, so Fraction is the important topic in mathematics and as the basic from various materials in learning mathematics. The ability to operate Fraction is needed so much by students for the next mathematics learning. One operation in Fraction is multiplication. Most the students of junior high school especially 7th grade have a difficulty in multiplying Fraction. It is influenced by the concept of understanding which is lees appropriate.

Fraction states a part of the whole. If a and b are integers with $b \neq 0$ and $b > a$, Fraction $\frac{a}{b}$ represents a is part of b as the whole object, for example length, height, width, weight, volume, etc. In fraction $\frac{a}{b}$, a is called numerator, while b is called denominator. The materials of Fraction in student book of junior high school 7th grade semester 1 include comparing Fraction, adding and subtracting Fraction, multiplying and dividing Fraction, and understanding rational numbers, and understanding the numbers pattern.

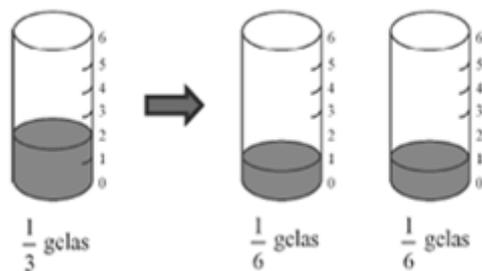
In mathematics book of junior high school, the operation of Fraction division is shown with media calibrated beaker like in picture 4.



Picture 4. Division illustration $\frac{1}{3} : 2 = \frac{1}{6}$ (Asari,2014:63)



Picture 5. Division illustration $1 : \frac{1}{3} = 3$ (Asari,2014:64)



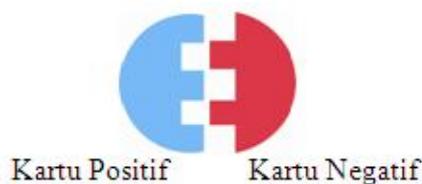
Picture 6. Division illustration $\frac{1}{3} : \frac{1}{6} = 2$ (Asari,2014:65)

In the example above, divisor is the amount of the liquid in the glass/ beaker, while in the example before divisor is the number of the beakers that must be given the liquid. It is not consistent. With the pattern like that, if there is a problem $1 : \frac{1}{2}$ and $1 : 2$, presentation in the media used will seem the same. Thus, the way to see the media consistently is needed so the next difficult material can be understood by the students.

Learning media for Integers and Fraction Materials

Paired card media

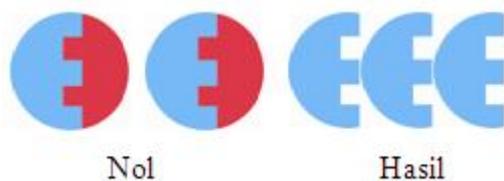
This media is used to implant the concept of addition and subtraction on integers. This media is used for individual and group. The form of the card is seen in picture 1. The card has two colors, red and blue. The blue card is to show the positive number and the red card is to show the negative integers.



Picture 1. Paired card

For the use, the students need to be explained first that if the blue card (positive) is paired with the red card (negative) the result is 0 (zero). For example the problem $5 + (-2)$, the way is take 5

positive cards, then add two red cards, pair each blue card with one red card. The result is the cards that do not have pairs are the 3 blue cards. It means the answer is 3 positive. Thus, $5 + (-2) = 3$



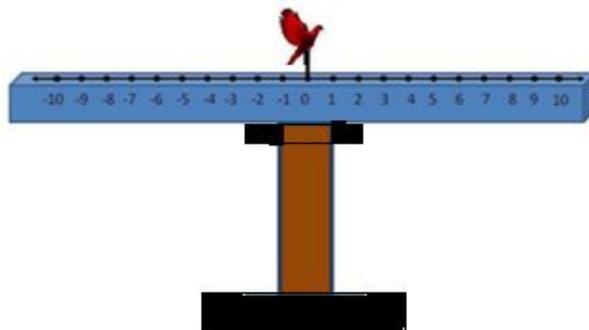
Picture 2. Paired card on operation $5 + (-2) = 3$

For the problem of negative numbers subtraction, like $5 - (-3)$, the way is take 5 blue cards, because it will be subtracted -3 and there is no a red card yet, take 3 pairs of zero cards. Because it is subtraction, take 3 red cards (-3) that has been there already. The result is there are 8 blue cards, so the answer is 8 positive.

The strong point in using this media is it can be used to present addition and negative numbers subtraction, even for negative numbers subtraction. Another strong point is that the form of a pair of card is like zero (0). Thus, it can reduce the cognitive load of students and make the teachers easy in presenting media. Swezler (1994) stated that, if, as in some areas, interactions between many elements must be learned, then intrinsic cognitive load will be high.

Number Line Block

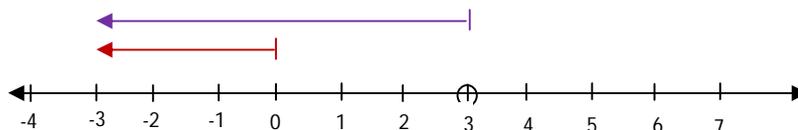
Number line block is a board given a picture of number line and model like a bird or another model that has front side and back side. This media can be used for addition operation and integers subtraction. The form of this media is seen in picture 3.



Picture 3. Number line block

To optimize the use of media, the learning process should be done cooperatively or in groups, so 1 media is used maximum for 5 students. The strong point of this media is it can help students understand the addition operation and subtraction of integers. The students can know the difference between 'positive number is added with positive number' and 'positive number is subtraction with negative number' to make the same number. The form of this media is like number line, so the use can be combined by using number line. The weakness of this media, physically it is too big and too heavy and the scale used is limited, so it can also be use for the limited integers too.

At the stage of the introduction of the concept of semi-concrete, the use of media directed at how to use the number line (Muhsetyo, 2008:3.53). For example, to show $-3 - (-6)$, first model goes to -3 on the board of number line. Then, because the next operand is negative number, the model is faced to negative number (face the left side). Because the operation is subtraction, model retreats 6 steps, so model is in number 3 as the final result. This problem can be represented in the form of number line like in picture 4.

Picture 4. The representation of $-3 - (-6)$ with number line

Based on the number line, $(-3) - (-6) = 3$. The result of $-3 - (-6)$ is the same with the result of $-3 + 6$ namely 3. The students' activities have to be directed to make the students able to conclude that for a and b any positive integers, so $a - (-b) = a + b$.

Number line block is also suitable for multiplication and division of integers. By using the modified rules in accordance with the concept of multiplication and division, multiplication and division of integers can be represented more clearly. Students are not only given formula or table that states the sign of the result of the multiplication or division of two integers, but the students themselves demonstrate the concept. This makes students more familiar with the concept of multiplication and division being studied.

Number Line Straw

The principle of this media is the same as Number line block, but there is something different that is there are two different sides. The front side is blue with two arms showing positive in the right arm and negative in the left arm while the back side is red with the opposite sign position, like picture 5.



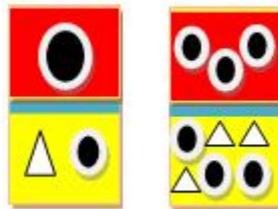
Picture 5 Number line straw

To use this media, pay attention on the straw. Consider the anode is the front and the cathode is the back. Put the straw in the zero with the blue side face the front. The straw goes to the first number in the problem. After that, watch the operation in the problem. If the operation is subtraction, turn the straw so the surface changes into red. If the operation is addition, do not change the straw surface. Last, watch the next number. If it is positive number, make steps to the anode as many as the number in the problem. If the next number is negative, make the steps to cathode as many as the number in the problem. Watch the point where the straw is now. That is the result of integers operation.

By using the media, the students are hoped to be able to understand why a number that is subtracted by a negative number the result is the same as by adding the positive numbers, or for a, b the integers are the same as $a - (-b) = a + b$. Thus, the students are hoped not only memorizing the pattern or rule.

Dominoes of ratio number equality Comparison

Dominoes of equality Comparison are learning media having form like dominoes cards. These cards consist of the pictures of planes. Every card has some pictures of planes showing fraction value. Every card also has other cards that have the same fraction value. The students are asked to find the pair of the card. Here are the examples of the dominoes cards (picture 6).



Picture 6 Dominoes of ratio number equality

The rules of ratio number equality comparison cards are: the dominoes cards are shuffled. Every player gets 3 cards. The cards got are written in LKPD. The rest of the cards are put in the middle, face down. The players by turns take one card facing down. If the player gets the pair cards of equality comparison, it means the student gets 1 point and the score is 100. If there is no anymore card in the middle, they will use open cards system. It means that all players open all the cards they have. The player that gets turn to play may take one card from other players until there are no more cards. The students who get the highest point, he is the winner.

Fraction Strip

Fraction strip is the media to understand fraction. Some simple fractions ($\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{8}, \frac{2}{3}$, etc) are usually used for learning by using fraction strip. The media is like in picture 7. To use the media, there are two kinds of fraction addition in the worksheet namely, the fraction addition of same denominator and the fraction addition of different denominator.



Picture 7. Fraction strip

The process to make the fraction strip media is relatively easy and the stuff is available around us. The form of fraction strip should be designed in different colors to make the students easier to understand a fraction concept on fraction strip. The activities of sticking, cutting, and folding make the students active in learning. The activities done are designed simply to make the students understand the fraction addition. Besides, the variation of activities done can increase the students' interaction.

The use of this media needs to get attention in folding activity, there are many folds formed are different. It depends on the students' neatness. To solve the problem, the teacher needs to stimulate the students to fold neatly, so they will form the folds well. The use of inappropriate paper (for example less thick paper) can make the students difficult to create good folds.

Conclusion and Suggestion.

The things that must be prepared by the teacher in learning are: learn the material that will be taught, make the lesson plan and prepare the media. The materials of integers and fraction in junior high school 7th grade have been analyzed in this writing. There are some things that are needed to be paid attention by the teacher, so the teacher is not wrong in implementing the book in learning. The alternative learning media has been served and discussed with the hope that the teacher can use it. Learning media must be made to make the students easy to learn, and not make the students difficult to understand the material. Marshall

& Paul (2008) states that for mathematics manipulatives to be effective, they must be part of a carefully planned mathematics program.

In designing the students' learning activities, something that must be cared is that the activities made have a pattern and an objective, so the students can get or conclude something that is suitable with what is hoped. It must not make the students confused when they are asked to conclude because of the wrong thing in designing learning.

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