Variations of Learning Media Reduction and Addition

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Abstract—**Mathematics directs students to have objective, meticulous, critical, analytical, and logical thinking skills. The use of learning media can make it easier for students to understand from concrete to abstraction. Hence, the use of learning media is considered very suitable in students, especially about the concept of integer count operation. The sum and subtraction are the materials that must be mastered by the students. This material is considered difficult by students. Through instructional media, addition and subtraction materials will not be difficult anymore. Some of the media that can be used to improve students' thinking skills in addition and subtraction are the medium of beads and number cards. Through this medium, students will learn the addition and subtraction so that without difficulty. Hence, the experience of students in solving problems becomes increased**

Keywords—addition, subtraction, beads, and number cards

I. Introduction

Mathematics is one of the content of lessons contained in the theme lesson. Mathematics is a subject that is considered the most weight compared with other subjects. Mathematics learning leads students to have objective, meticulous, analytical and logical thinking skills. In order to fulfill these abilities, the first and most important skills that every learner should possess are the ability to read, write, and count which is considered to be the foundation and main vehicle for students to explore and develop knowledge and technology. In numerical matter, students must be able to perform integer and fraction counting operations and use them in story problems (problem solving). While on the material geometry and measurement, students are required to calculate the distance, time, weight, volume area, and properties wake flat.

Currently, there are still many students who have difficulty in doing the sum because most of the students in doing the questions given by the teacher still use the finger in the calculation [1]. This resulted in the student often forgetting when summing back the next number. While the students working on the problem of reduction are still confused in understanding the meaning of the reduction, so the teacher must explain again more clearly using a variety of words with the same meaning, for example taken, eliminated, or discarded until students understand the purpose of the reduction problem so that students' about the addition and reduction and the students' learning outcomes are still low.

In addition to the above problems, observations made at the beginning of the first semester also resulted in some findings, such as when performing the sum operation performed from the left and did not pay attention to the value of the place. It should be in the operation of the sum number downward (bottom row) which is done first from the right, where the right side is calculated from units, tens and hundreds. Also do not do the storage during addition operation and the results are directly on write it. Hence, also in terms of reduction.

During this math learning is only used as a place to apply the concept. In school, students are only taught theories, then given examples, then given the exercise questions, so the students' understanding of the concept is very weak and often the students have difficulties. In addition, the sequence of learning as above is less in line with the intellectual development of students who develop from concrete to abstract. Reys in [2] argues that most teachers use textbooks when teaching math at school. If this is seen from the daily learning activities is in delivering the subject matter, the teacher still emphasizes the concepts contained in the book and have not utilized the learning media maximally in the learning process. Because just taught about numbers is sometimes considered easy by the teacher so as to be trivialized by teaching without media. This can result in low student learning outcomes especially in addition and subtraction metrics. In addition, the liveliness of learning and creativity of student learning is still low because it is not the maximum use of learning media in the learning process on the material addition and subtraction.

Learning is an activity that proceeds and is a very important element in the implementation of each type and level of education. Smaldino in [3] states that learning is the development of new knowledge, skills, or attitudes as an individual interacts with information and the environment. Changes that occur not only from the cognitive aspects, but rather affective and psychomotor aspects. This means that the success or failure of the achievement of the educational goals is very dependent on the learning process experienced by students. The teacher must prepare an appropriate learning model so that students can be better prepared to learn [2]. One of them is the teacher should be able to use the media as an integral material in the learning process as well as possible. By using interesting media, students will be more enthusiastic in following the lesson. In addition, the use

of interesting media can make it easier for students to better understand and understand the material being taught. Learning activities are no longer just teaching activities that ignore the learning activities is just preparing teaching and implementing teaching procedures in face-to-face learning. However, learning activities are more complex and implemented with varied learning patterns.

The purpose of mathematics learning can be achieved if a teacher can create conditions and learning situations that enable students to actively shape, discover and develop their abilities. The use of learning media becomes an important thing in the learning process, especially at the elementary school level. Primary school students who are on average in the 7-11 years age range are generally more able to understand a concept if the concept is presented first through concrete objects or real objects that they can see directly. This is in line with Piaget's theory that a primary school student is in general at a concrete operational stage. This means that to understand a student concept should still be given activities that are directly related to various objects or media are also real activities that they can understand. This opinion is reinforced by Marzbach*et al*., in [4] who stated that contemporary mathematicians formulate statements about abstract concepts that are subject to verification by proof. Learning media is a bridge that allows students to understand from concrete to abstract. Hence, the use of learning media is considered very suitable in students, especially about the concept of integer count operation.

There are many media that can be used in learning material counting integer operations. Therefore, this research will present variations of instructional media that will be used in math lessons to apply the concept of addition and reduction of numbers so that students can easily understand the material to be submitted by the teacher.

The rest of this paper is organized as follow: Section II describes the related works. Section III presents the data and following by methodology. Section IV presents brief results obtained. Finally, Section V concludes this work.

II. RELATED WORKS

The use of concrete objects in accordance with the stage of development of elementary school age children below. With the use of concrete media objects can help students understand in learning mathematics because through the media students experience in solving problems to grow. As is now developing in Indonesia is the learning of RME (Realistic Mathematics Education) or PMR (Realistic Mathematics Education) where in the learning presented a process of activities, not as finished products and lesson material presented through the story material in accordance with the student environment (contextual). This is in accordance with the concept of iceberg which is the guide by RME (see Figure 1).

Iceberg points out that the learning stage a student must take in learning starts from the concrete things that students often encounter in their daily lives. Then gradually introduced to the more abstract. Through the media the goal of education will be easily achieved. A teacher should be able to develop learning media so that the learning process becomes more meaningful. Media used for underage

elementary school children is a concrete object media or in this study using media abacus, number cards, and LKS as a tool in counting and subtraction counting operations.
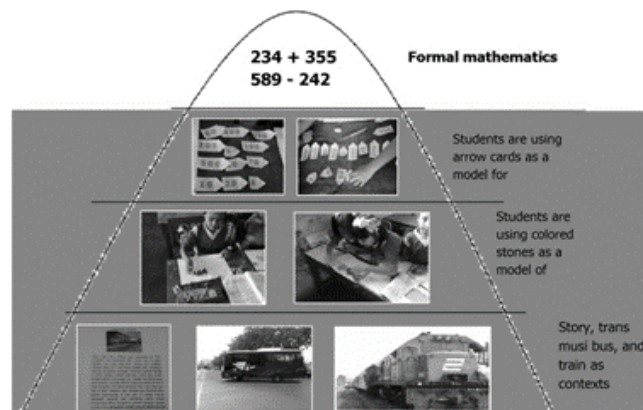

Fig.1. Iceberg

Good media according to the Indonesian Realistic Mathematics Education (PMRI) is (1) the use of real context as the opening in learning to be explored, (2) the use of models, (3) the use of student learning outcomes and construction, (4) interaction in the learning process or interactivity, (5) the connection (connection) in various parts of the subject matter. Based on the above characteristics, good learning media involves all the senses of students to feel, see, and feel for everything that can be used to receive and absorb easily and well messages in the material presented by the teacher.

Teachers are required to work professionally by mastering the five skills in communicating the action of teaching. The five skills are teaching skills, managing learning stages, utilizing methods and using the media and allocating time. By mastering these five skills teachers will be able to manage the learning process so that students can learn in a fun atmosphere (unjoyful), as well as high activity both mentally, physically, socially and emotionally. In this case a teacher's didactic ability is decisive.

The main didactic principles that teachers have to live and apply in managing their learning are as follows:

A. Principle Apperception

The knowledge that students already possess can be used to understand something unknown, so apperception can arouse interest and attention to something.

B. Demonstration Principles

Demonstration is a very effective learning method, because with the demonstration students will be more interested especially if the demonstration depicts the actual activity.

Demonstration principle can be realized in the form of direct experience, arranged experience, dramatization, demonstration, field trip, exhibition, television as props, film as props, and picture as props.

C. Motivation Principles

In carrying out its functions, the teacher has a duty to encourage students to do or not to do something for the sake of the success of learning goals.

D. *The Principle of Active Learning*

For students to succeed well in learning then he should be encouraged to engage actively both mentally and physically.

E. *Principles of Cooperation*

In the process of education students should be given the opportunity to practice how-to live-in groups and solve problems faced together.

F. *Students Themselves Principles*

Students as learners should be treated according to their age and maturity. Gradually the students must be taught to be able to solve the problems faced by the students themselves.

G. *Principle of Adjustment to Student Individuals*

Because the ability of each student in mastering a material lesson different then the teacher is required to be able to adjust to the speed of each child.

H. *Principles of Correlation*

The correlation principle is linking the subject matter taught with other subjects in one subject or with other lessons.

I. *Regular Evaluation Principle*

Evaluating the teaching and learning process shown by the performance of students in learning needs to be done regularly and continuously during and after the learning process takes place. Evaluation is carried out by embracing the principles of holistic, continuous, goal-oriented, objective, open, meaningful, and educational.

Based on this understanding, a teacher must understand the principles didacticin learning process.Media that can be used to describe concretely the calculation process on integers is to use bead media as can be seen in Figure 2. The shape of these beads can be spherical like spheres. This tool consists of one color is white. The size of the beads is 30 mm. In its use, the beads will be strung together using a string (string).

Fig.2. Bead Media

A number card is a card made of cardboard of 10 cm × 10 cm in which there is a number. The numbers on the number cards are hundreds, tens and numbers.Numeric cards are given in the form of games that can help students in learning count operations, especially sum and subtraction. Using the number card media can make it easier for students to understand the addition and subtraction (see in Figure 3).
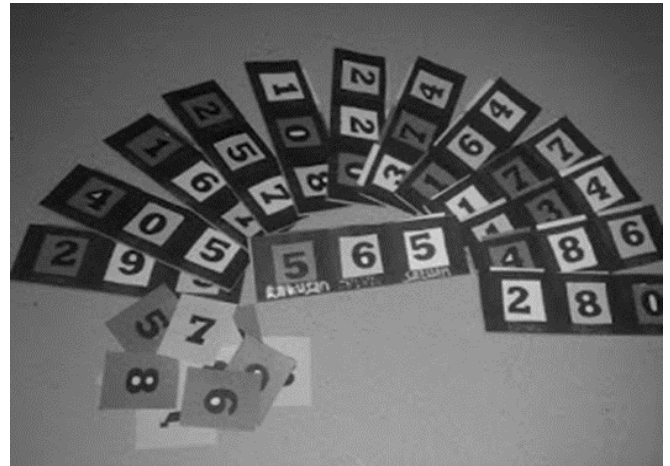

Fig.3. Number Card

The summation is to combine the number of two or more numbers into a new number. Freudenthal in [5] states that "Then all that is left is an infinite system of things, distinguished by symbols, and a table with two entries which, for every pair of these things, tells what you want to be their sum. The relations in this system are of the form a + b = c. It is what one calls an addition structure ".

Furthermore, Musser in [6] explains "The number a + b, read" a plus b, "is called the sum of a and b, and a and b are called addends or summands of a + b". Next still in Musser "Addition is called a binary operation because two (" bi ") numbers are combinedto produce a unique (one and only one) number ".

While the reduction is taking a number of numbers from a certain number. Still according to Sukayanti in [7] Reduction is the opposite of sum, but reduction does not have properties possessed by addition. The reduction does not meet the nature of the exchange, the nature of the identity, and the nature of the grouping. Reduction is written using the (-) sign between the two numbers. The result of the deduction is denoted by an equal sign (=). The same opinion as expressed by Musser in [6] "The number" a - b "is called the difference and is read" a minus b, "where a is called the minuend and b the subtrahend".

The concept of addition can be developed through real experience [8]. Through this experience, students will manipulate the objects and use the language that will be associated with the symbol of addition. This is like that delivered by NCTM. According to NCTM [9]. In addition to work with the whole number, young people should have some experience with the same fractions through connections.The same opinion is also expressed Bennet in [10]. Elementary school students often incorrectly employed "when in doubt, add" strategy. This is attributed to an aspect of poorly developed conceptual knowledge. This opinion is reinforced by Ma [11]. Ma in [11] revealed that most of the U.S. teachers said they would use manipulative to help students understand the fact that 1 ten equals 10 ones.

Mathematics learning in elementary school, especially elementary school is done with integrated thematic learning approach. In accordance with Permendikbud Number 24 of 2016, Annex Number 14, the minimum learning abilities and abilities that the learners have to achieve for the content of

mathematics lesson is able to explain, conduct and solve daily life problems related to the sum and subtraction of numbers that involve counting numbers up to 99. For class 2 that must be studied is the number of counts to 999. As for the class 3 can explain the characteristics of counting operations on the number of counts and solve problems that involve the use of counting operations in counting.

Given the importance of the ability that must be possessed by students in lower classes, then using a variety of media will allow students to be able to achieve basic competencies that must be mastered.

III. MATERIAL & METHODOLOGY

A. Data

The subject of the trial is the target of the product users of elementary school students of SD Muhammadiyah Sapen Yogyakarta. The total test subject is 42 people, with details:

1. Class I Al Sijzi SD Muhammadiyah Sapen Yogyakarta amounted to 10 people used as subjects try research instrument.

2. Class I Al Khawarizmi SD Muhammadiyah Sapen Yogyakarta amounted to 10 people used as subjects try small groups.

3. Class I CIMIPA Jabir Ibnu Khayyam SD Muhammadiyah Sapen Yogyakarta amounted to 22 people used as subjects of field trials.

The research subjects were randomly selected and each of the test subjects taken represented the lower, middle, and upper groups. The lower, middle, and upper groups represent the sample of students with low, moderate, and high ability.

To obtain valid data, this study uses observation and test techniques. Observations are used to obtain the necessary data as a basis for conducting further research. With the observation will be obtained data about all activities or behavior of students in learning. In this activity, researchers will play an active role in all learning in the classroom. This observation is done directly without any intermediaries to the object to be studied. Observations will be conducted on the students of grades 1, 2, and 3 to know the ability to count the sum and subtraction of students and students' activities during the learning process takes place.

The test is meant to measure how far the students' ability to acquire after the learning activity is done. The test of addition and subtraction was given at the beginning of the study to identify the student's lack or weakness in counting. In addition, the tests are given at the end of the study to determine the student's increased, active, and creativity about addition and subtraction. The test is a written test in the form of a questionnaire with the number of questions 5.

B. Proposed Method

This type of research is development research. In this study focused on the development of learning media consisting of beads and number cards. This research includes qualitative research seen from the aspects of valid, practical, and effective. This study aims to develop learning media using a realistic mathematics education approach that meets the valid, practical, and effective aspects. In this research use ADDIE model developed [12]. The ADDIE development model consists of five stages including Analysis, Design, Development or Production, Implementation or Delivery and Evaluation. Here's a chart from ADDIE:
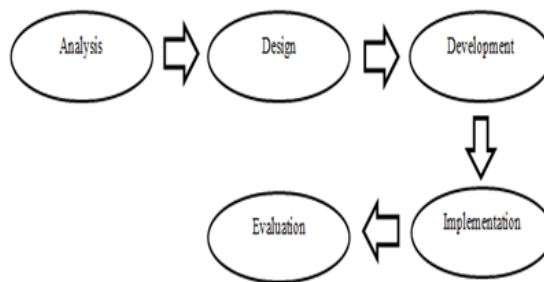

Fig.4. Model ADDIE

Data analysis techniques conducted in this research are quantitative descriptive analysis and qualitative analysis. Quantitative descriptive analysis is done to analyze the data: the scale of the value of the result of the assessment of the material experts to the draft, the observed data of the material experts to the media, the observed data on the effectiveness of the media, and the student's judgment from the teacher.

For the material expert and observation scores data using the value scale. The appraiser gives tick marks ($\sqrt{}$) on the corresponding column. In this case there are four types of values, namely the results of the assessment get the value of 1 if it states very bad / very less appropriate / very less clear, the value 2 if it states less good / less appropriate / less clear, get the value 3 if declared good / appropriate / clear, and get a score of 4 if it states very well / very appropriate / very clear. The way of scoring on the value scale is adjusted to 3 categories as decribed in Table I which is according to Azwar in [13] namely:

TABLE I: CATEGORY SCORE FORMULAS

Interval Score	Category
$X < (\mu - 1.0\sigma)$	Low
$(\mu - 1.0\sigma) \leq X < (\mu + 1.0\sigma)$	Moderate
$(\mu + 1.0\sigma) \leq X$	High

The test results data were analyzed by statistics. The raw score earned is then converted to a standard T (T Score) value to generalize the unit. After the score unit is generalized then made the assessment norms in accordance with the test results obtained. The formula used in accordance with Burhan Nurgiyantoro in [14], namely:

$$T = 50 + 10 z$$

Validity of media variation is the correlation coefficient between new media variation score and expert judgment. While the composite score correlates the score of the new item with the total score of all items. The validity of media variation in this study was obtained by correlating the test results obtained with teacher assessment results. The correlation used Spearman Rank Correlation with Hadi in [15] with formula:

$$\rho = 1 - \frac{6 \sum D^2}{N(N^2 - 1)}$$

Test reliability using test-retests. The *r* value is derived from the first and second information literature (repetition) using Cronbach's alpha analysis.

IV. RESULTS AND DIscussion

Through instructional media, addition and subtraction materials will not be difficult anymore. Some of the media that can be used to improve students' thinking skills in addition and subtraction are the medium of beads and number cards. Through this medium, students will learn the addition and subtraction so that without difficulty. Hence, the experience of students in solving problems becomes increased.

V. CONCLUSION

Based on the above results, it can be concluded as follows (1) beads media can improve creativity and activity on the addition and subtraction lesson (2) media number cards can increase creativity and activities on the learning of addition and subtraction. Learning mathematics by using media, especially for undergraduate students can improve students' creativity and activity. Through the variation of instructional media, especially the beads and student number cards in the learning of addition and subtraction increases. In addition, with the development of these media variations, the creativity and activity of students in the learning process is increasing. This research focuses only on bead media and number cards only, it is recommended for subsequent researchers to use more interesting variations of other media.

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