Hand’s on Activity to Increase Student’s Understanding about Place Value at Elementary School

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Abstract. The purpose of this research was to increase student’s understanding about place value at elementary school. This research was conducted at second grade of an elementary public school no 13 in Kecamatan Padang Barat. There were three phases of the development: preliminary research, development/prototype phase, and assessment phase. The model of development was adapted from Plomp model. This research was focused until development/prototyping and implementation. The first step was discuss with teacher to get some information about the problems in mathematics instruction at the second grade. The teacher still have the difficulty how to show the real process in addition and subtraction operation at natural number. The second step was preparing the Base Ten Blocks and creating the booklet about how to use it. In this prototyping phase the booklet was corrected by teacher and expert. This phase had micro-cycle until the teacher and the students find the booklet useful. In first prototype, validation was conducted by self-evaluation and expert review. After the revision of the first prototype, the second prototype was created, and then it was used to know about its practicality by implementation in small group evaluation and student in class.

1. Introduction
This paper describe how base ten blocks can be used to help teacher show the real process about place value at natural numbers, especially in addition and subtraction operation. Mathematics is one of subject that studied at Elementary School. Student at Elementary School are around (7-11 years old). They are start thinking logic Mathematics. Piaget said that student logically thinking based on manipulation object [1]. For the purpose of this study, teacher can used booklet and base ten blocks to teach student in real situation. Students can be used it to understand about place value at natural numbers.

Based on the regulation of Minister of Education and Culture, mathematics instruction wish to start in real situation (contextual problem). The term manipulative is defined as, items that students use to support hands-on learning [2]. Base ten blocks provide visible models that help students solve problems and develop concepts.

In recent years, especially in Mathematics, many have a questioned whether using manipulative is beneficial and some have suggested that manipulative are over-rated as a teaching resource [2]. Manipulative can be arrange from paper and plastic. Manipulative materials are objects designed to represent explicitly and concretely mathematical ideas that are abstract. They have both visual and tactile appeal and can be manipulated by learners trough hands-on experiences [3]. Research suggests that manipulative can help students develop mathematics concept in a concrete form that is visual to the learner [4].
2. Methodology
The development of this research was adapted from Plomp model. At the primary research step was giving a questionnaire to the teacher for getting some information about the problems in mathematics instruction at the second grade. The problem was teacher still have the difficulty how to show the real process about place value in addition and subtraction operation at natural numbers. The second step was preparing the base ten blocks and creating the booklet about how to use base ten blocks. The procedure to develop the booklet that can be useful for teacher and student to describe and understand about place value and the real process of addition and subtraction operation at natural number are preliminary research and development/prototype phase. This research was conducted at second grade of an elementary public school no 13 in Kecamatan Padang Barat.

3. Results
The development of booklet has two phase, they are preliminary and prototyping. There are three main steps in preliminary phase: structure analysis, concept analysis and teacher need analysis. The structure analysis focus based on cognitive, affective and psychomotor indicator. The concept analysis focused on place value in addition and subtraction operation at natural numbers. The second step was preparing the base ten blocks and creating the booklet about how to use its. In this prototyping phase the booklet was corrected by teacher and expert. This phase had micro-cycle until the teacher and the students find the booklet useful. In first prototype, validation was conducted by self-evaluation and expert review. After the revision of the first prototype, the second prototype was created, and then it was used to know about its practicality by implementation in small group evaluation.

First prototype, booklet have been revision based on result validation from mathematics and language expert.

| No | Expert     | Evaluation | Validity (%) | Category   |
|----|------------|------------|--------------|------------|
| 1  | Mathematics| Content    | 95.50        | Very valid |
|    |           | Language   | 85           | Very valid |
|    |           | Presentation| 87           | Very valid |
|    |           | Picture    | 93.75        | Very valid |
| 2  | Language  | Sentence   | 90           | Very valid |

The second prototype was created based on self-evaluation and expert validation, and then it was used to know about its practicality by implementation in small group evaluation. Try out for practicality have been done to six students at second grade in elementary school. They are two students in higher level, two students in middle level, and two students in lower level.

Based on an observation since the students practice, they look very interesting and happy done the problems about place value in addition and subtraction operation at natural numbers.
Figure 2. Students’ expression using base ten blocks

After small group evaluation, a questionnaire gave to the teacher about the practicality of booklet to practice using base ten blocks.

Table 2. Questionnaire Analysis from Teacher

| No | Aspect        | Practicality (%) | Category       |
|----|---------------|------------------|----------------|
| 1  | Simple Useful | 95               | Very practice  |
| 2  | Benefit       | 95               | Very practice  |
| 3  | Times appropriate | 75         | Very practice  |

The teachers involve gave various reasons for using manipulative. One of these was that using them was more enjoyable than doing mathematics that was solely abstract and symbolic. This was substantiated by the teachers’ observation that students were active, engaged and interested in lessons when manipulative used [5].

4. Discussion

In addition and subtraction operation at natural numbers base ten blocks can be used to understand about place value in real situation. Before using the base ten blocks, we have to agree with the regulation that the plate square be a hundred, a long block be a ten, and a small square be a unit. See the figures bellow:

![Figure 3. Figure of blocks](image)

1 ten = 10 units
1 hundred = 10 tens = 100 units
In addition and subtraction operation for natural numbers base ten blocks can be used to show the real process about place value. Here some examples:

1. \( 54 + 17 = \) ...........
   To find the answer used the base ten blocks as follows

\[
\begin{align*}
\text{Figure 4. The illustration (54 + 17 = ...)} & \text{ by using blocks} \\
\end{align*}
\]

From that figures we can see that:
4 units + 7 unit = 11 units
\[= 1 \text{ ten } + 1 \text{ unit}\]

2. \( 32 - 15 = \) ...........

\[
\begin{align*}
\text{Figure 5. The illustration (54 + 17 = 71) by using blocks} \\
\end{align*}
\]

So, the answer of \( 54 + 17 = 71 \)

2. \( 32 - 15 = \) ...........

\[
\begin{align*}
\text{Figure 6. The illustration of 32 by using blocks} \\
\end{align*}
\]

We cannot take away 5 of 2, so we have to change 1 ten be 10 units, base ten blocks be 2 tens and 12 units:


Figure 7. The illustration of \((32-15=17)\) by using blocks

So, the answer of \(32 - 15 = 17\)

In addition process we have to explain that its means compound and subtraction means take away to understand the real concept about place value. Since students doing mathematics using base ten blocks, they look so happy and enjoy it.

The teachers have to give more exercises for students to make them fully understand at the concept in addition and subtraction operation at natural numbers especially about place value.

5. Conclusion
During using base ten blocks and booklet in mathematics instruction especially for addition and subtraction operation at natural numbers especially to understand about place value. Some advantages by using manipulative that can be: more powerful tools to support sense making, mathematical thinking and reasoning when they are used as a tools to support these process rather than as a adjuncts to blindly following a taught procedure to achieve at an answer.

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