Development of learning tools based on contextual teaching and learning in fifth grade of primary schools

R Yuwandra1, I M Arnawa*  
1Mathematics Department, Universitas Negeri Padang, Padang, Indonesia  
2Mathematics Department, Universitas Andalas, Padang, Indonesia  

*corresponding author : arnawa1963@gmail.com

Abstract. The goals of this study is to produce the learning tools of mathematics with a valid, practical and effective CTL approach. The developed learning tool consist of a lesson plan and a student worksheet. The development model used in this study is the Plomp model (preliminary research, prototyping phase, and assessment phase). The device created is used to improve understanding of concepts and mathematical problem solving for elementary school students. The instruments used were validation sheets, teacher, and student response questionnaires and mathematics learning achievement tests. Learning devices are said to be valid if they meet the content and construct validity. Practicality seen from the ease of use of the device. The effectiveness of the device seen from the percentage of students’ completeness of the test at least 70%. The results of the experts’ validation show that the learning device meets the valid criteria. Practicality reaches very practical criteria based on the questionnaire responses of teachers and students. The percentage of students' completeness tests is 75%.

1. Introduction
Based on our preliminary observation, the learning is still teacher-centered. Learning resources only use books from school and no other support such as student worksheets. As a result, students have not understand about the concepts and solve problems of mathematics.

The solution for the problem above is develop learning tools with the Contextual Teaching and Learning (CTL) approach so that the ability to understand concepts, students' mathematical problem solving abilities increase, and their learning outcomes increase. This learning approach has been applied by previous researchers at the international and national level. The research was successful because this CTL is one approach that is assumed to be able to overcome the problem around students. The CTL approach can improve learning outcomes [1] - [8], improve the quality of elementary school education [9]. CTL can also be practiced in a family environment [10]. In addition, CTL-based module development has valid, practical and effective results [11] - [13]. CTL can also improve students' understanding of mathematical concept skills [14] - [17]. Research with the CTL approach can also improve students' mathematical problem solving abilities [18]. Although the use of learning by using CTL has been widely used in research in various countries, but it should also be applied in the form of developing learning tools for understanding concepts and solving mathematical problems of students in fifth grade elementary school.
CTL is learning that press with the process of full involvement of students to be able to find the material being learned and relate it to real life situations. So that, it encourages them to apply it in their daily life [19]. The CTL approach also has seven components or 7 principles, namely constructivism, finding, asking, learning communities, modeling, reflection, and real assessment [20].

Understanding of mathematical concepts in elementary school is important in the world of education, because mathematics education in elementary schools is the beginning for a child to explore his ability to understand mathematical concepts [18]. The importance of understanding mathematical concepts in order to solve problems and be able to apply these learning in the real world [16]. So, understanding the concept needs to be maximized at the elementary school, so students do not marry at the next level.

Problem solving skills are also very important at the elementary school. Problem solving skills must be owned and developed by students in the process of learning mathematics [21]. This means that problem solving in learning mathematics is seen as a goal that must be achieved. So, mathematical problem solving in elementary school must also be maximized. Because the students in elementary school also learn lessons related to daily life and its existence is very vital in the 2013 curriculum.

2. Method
This type of research is Research and Development (R&D) by using Plomp model. Research and development is research methods used to produce certain products and test the practicality of these products [22]. The products developed in this study are lesson plan and student worksheet with CTL approach to increase the ability to understand concepts and solve mathematical problem solving for fifth grade elementary school students. After the product is developed, it is tested for its validity, practicality, and effectiveness.

The development research is a method used to produce certain products. Plomp model consists of three phases, such are preliminary research, development or prototyping phase, and assessment phase [23]. In the initial investigation phase (preliminary research) there are a number of activities carried out namely requirements analysis, curriculum analysis, student analysis and concept analysis.

The development phase (prototyping phase) consists of prototype 1, namely self-evaluation and expert review. Self-evaluation (self evaluation) is evaluating the lesson plan and student worksheet that have been designed by the researchers themselves. After being corrected, an assessment stage is carried out by an expert or expert reviews. In the expert review validated by 5 experts called the validator consisting of 3 mathematic education experts, one educational technology expert and one Indonesian language expert. Prototype 2 is one-to-one evaluation. In the one-on-one evaluation involving 3 high-grade, medium and low grade V grade students. prototype 3 was evaluated by small groups. Small group evaluation was carried out in class V SDIT Adzkia 2 Padang which consisted of 6 students, namely 2 high abilities, 2 medium abilities and 2 low abilities. In prototype 4, a field test was conducted. In the assessment phase, the field test was conducted in fifth grade SDIT Adzkia 2 Padang to see the practicality and effectiveness. Research data were collected through validation sheets, teacher response questionnaire sheets and student response questionnaire sheets, and student learning outcomes test results.

3. Results and Discussion
The results of the initial product development in the form of learning tools based on Contextual Teaching and Learning (CTL) learning using the Plomp model. Based on the results of the interview, the educator said that he had never used CTL approach and the educator stated that he was very interested in using it. Learners also show their interest as shown in the results of the practicality questionnaire given to teachers and students (Table 1).
Table 1. Results of Analysis of Practicality Questionnaire Data by Students in Small Group Evaluation

| No | Assessed Aspect | Average | Percentage of Practicality (%) | Criteria |
|----|----------------|---------|--------------------------------|----------|
| 1  | Attractiveness  | 3.44    | 86.1                           | VP       |
| 2  | Usage Process   | 3.53    | 88.3                           | VP       |
| 3  | Ease of Use     | 3.56    | 88.8                           | VP       |
| 4  | Time            | 3.83    | 95.8                           | VP       |
|    | Overall Average | 3.59    | 89.7                           | VP       |

Information: VP = Very Practical

Table 1 showed that the average percentage of practicality questionnaires by students in the small group evaluation are in the very practical category. The practicality assessment by students in the field test after CTL approach are presented in Table 2.

Table 2. Results of Analysis of Practicality Questionnaire Data by Students in the Field Test

| No | Assessed Aspect | Average | Percentage of Practicality (%) | Criteria |
|----|----------------|---------|--------------------------------|----------|
| 1  | Attractiveness  | 3.50    | 87.5                           | VP       |
| 2  | Usage Process   | 3.43    | 85.8                           | VP       |
| 3  | Ease of Use     | 3.47    | 86.8                           | VP       |
| 4  | Time            | 3.67    | 91.7                           | VP       |
|    | Overall Average | 3.51    | 87.9                           | VP       |

Information: VP = Very Practical

Table 2 showed that the average percentage of practicality questionnaires by students in the Field Test is in the very practical category. The practicality assessment by educators in the field test after using CTL approach are presented in Table 3.

Table 3. Results of Analysis of Practicality Questionnaire Data by Educators on Field Tests

| No | Assessed Aspect | Average | Percentage of Practicality (%) | Criteria |
|----|----------------|---------|--------------------------------|----------|
| 1  | Attractiveness  | 3.50    | 87.5                           | VP       |
| 2  | Usage Process   | 3.63    | 90.6                           | VP       |
| 3  | Ease of Use     | 3.60    | 90                             | VP       |
| 4  | Time            | 3.75    | 93.7                           | VP       |
|    | Overall Average | 3.61    | 90.5                           | VP       |

Information: VP = Very Practical

Table 3 showed that the learning tools developed are very practice. Based on field test that have been conducted show that learning tools with CTL approach are effective. It can be seen from the mathematics cognitive test, more than 70% of students have reached the Minimum Achievement Criteria. Affective learning outcomes obtained an average percentage of 75%.

4. Conclusions

Based on results and discussion, we conclude that the learning tools based on Contextual Teaching and Learning (CTL) are valid, practice, and effective. Learning with the CTL approach can make student more active.
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