LEARNING ONE VARIABLE LINEAR EQUATIONS AND INEQUATIONS USE STUDENT CONTEXTUAL-BASED WORKSHEETS

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Abstract

Students' worksheets are needed for effective learning, especially in the new normal era. Worksheets were develoved using the ADDIE development model. This research was conducted in class VII SMPN 23 Pekanbaru. Worksheets are tested for validity, prakticalitity and effectiveness in learning. Questionnaires were used to measure the level of validity and practicality. Effectiveness was measured using the test. The percentage was calculated to see the level of validity and practicality. The test result were analyzed using t-test. The results showed that contextual-based worksheets were valid, practical and effective. This contextual-based worksheet can be used to learn one variable equationts and inequations.

Keywords: ADDIE, effectiveness, contextual, intact group comparison, one-variable equations, and inequations

Introduction

In the new normal era, the government implements limited learning in schools to prevent the transmission of the Covid-19 virus. Based on a preliminary study conducted at SMP 23 Pekanbaru, it was found that each class was divided into two shifts in this school, and study time was reduced. Azhari & Fajri (2021) stated that schools must take the initiative to provide facilities supporting learning during a pandemic. Therefore, teachers need to design learning to be effective and efficient. Unfortunately, one of the essential elements in education, namely the teaching materials teachers use, is still inadequate. Providing teaching materials is essential to make it easier for students to understand the material (Prastowo, 2014). For example, in class VII SMP N 23 Pekanbaru, the teacher uses a Student Worksheet (LKS) printed using newsprint and not coloured. Of course, these worksheets are less attractive to students and affect student learning outcomes.

Interesting, student-oriented teaching materials that make learning more meaningful, effective, and efficient are needed. Teaching materials need to be designed by teachers who understand students' situations and needs (Noviarni, 2014). Innovations in LKS development are urgently needed. In developing LKS, a point of view or starting point is necessary (Sanjaya, 2011). The learning approach can be a starting point for systematic learning activities in LKS.

Students need to be faced with mathematical problems that are relevant to real-life (Khotimah & Masduki, 2016; Lund & Stains, 2015; Ojose, 2011). Prahmana & D'Ambrosio (2020) revealed that teachers must relate mathematical concepts to students' daily lives. Khirwadkar et al. (2020) added that an example of learning teachers can do during a pandemic is place math problems in a real-life context. A learning approach that uses real-life contexts, one of which is Contextual Teaching and Learning (CTL). Contextual problems are problems within the context of actual experiences (Furtado et al., 2019). It is further explained that this contextual problem plays an important role in mathematics. The CTL approach can support mathematics learning (Silseth & Erstad, 2018), and improve students'

mathematical abilities (Dayani & Hasanuddin, 2020; Nursamsi et al., 2020; Santoso, 2020; Surya et al., 2013; Yulinda et al., 2016). So, teachers need to innovate in designing interesting teaching materials using real-life contexts close to students' daily lives.

Several studies that develop CTL-based teaching materials have been carried out. Suhandri & Sari (2019) developed a module for relation and function material, Nurdin et al (2020) designed comic media for the concept of cubes and blocks, Norhayati et al. (2018) designed CTL-based multimedia. CTL-based worksheets for social arithmetic material were developed by (Dianita et al., 2016), comparisons (Gusmiro et al., 2017), arithmetic operations of algebraic forms (Loli et al., 2018), sets (Refianti et al., 2019) and linear programming (Iriani et al., 2021). Unlike those studies, the worksheet was developed for the material of linear equations and inequalities of one variable in this study. In the 2019 National Examination (UN), only 37.47% of SMP N 23 students could answer correctly. Therefore, this study aims to produce valid and practical CTL-based worksheets and test their effectiveness for learning one variable's linear equations and inequalities.

Method

This research and development (RnD) resulted in a new product in the form of a valid, practical, and effective Student Worksheet (LKS) based on Contextual Teaching and Learning (CTL). The development model used is ADDIE (analysis, design, development, implementation, and evaluation) (A Pribadi, 2014). The flow of the research can be seen in Figure 1. The questionnaire instrument was used to test the validity and practicality, and the posttest was used to test the effectiveness of the LKS. The effectiveness test was carried out pre-experimentation with an intact group comparison design (Sugiyono, 2013), as shown in Figure 2. This design was used due to the Covid-19 pandemic conditions, which required limited face-to-face learning. The maximum number of students in education is 20 people per class or one regular class divided into two learning shifts. Thus, the researcher only used 1 class, with the first shift as the experimental group and the second as the control group. The trial was conducted in class VII A of SMP N 23 Pekanbaru, with 19 students. The percentage of the questionnaire results is calculated to be compared with the criteria for the validity and practicality of the worksheets. Effectiveness analysis using t-test.
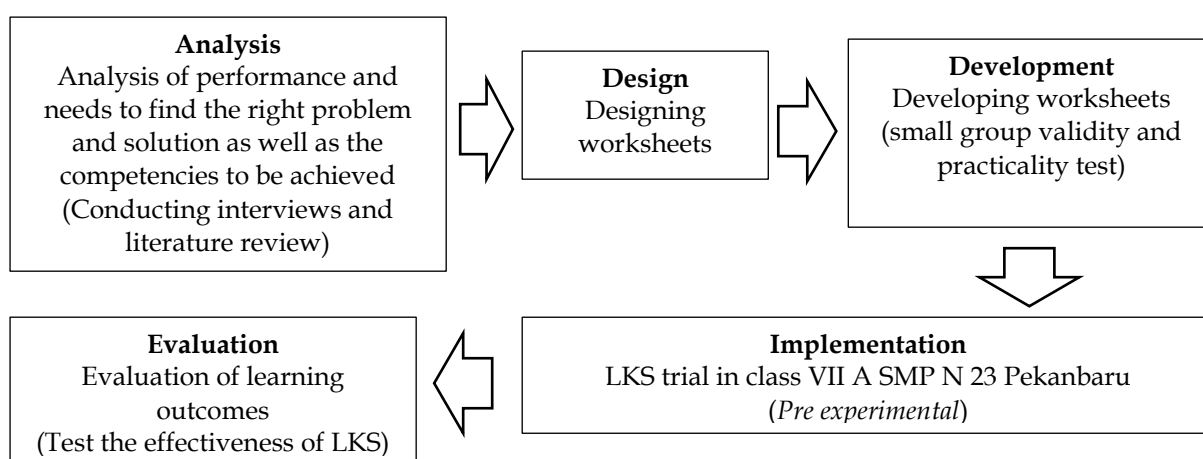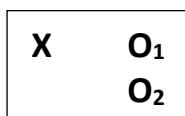

Figure 1. Research Flow

$$\boxed{\begin{array}{ll} X & O_1 \\ & O_2 \end{array}}$$

Figure 2. Design Intact Group Comparison

Description:

O_1 = the results of the measurement of half the treated group

O_2 = the results of the measurement of half the untreated group

Result and Discussion

The results of this study are described following the development steps carried out, as follows:

Analysis

In the early stages of this research, the analysis was carried out in two stages: performance analysis and needs analysis. Performance analysis is carried out to find the right problems and solutions. The results of observations at SMP N 23 Pekanbaru show that teachers use textbooks (packaged books) and LKS from publishers. It should be able to help students understand and do more questions in various forms. However, the use of these worksheets is still not fully effective, and students' interest in using these worksheets is still lacking. This is because the LKS from publishers is printed using newsprint and colorless, attracting students' interest. The lack of student interest in working on the questions in the LKS certainly affects student learning outcomes.

Therefore, we need an attractive, innovative, and creative teaching material. Researchers provide a solution in the form of CTL-based worksheets. This worksheet is presented with beautiful colors, pictures, and designs. In addition, the presentation of material starts from simple things that students easily understand. LKS presents contextual problems in everyday life.

Next, analyze the needs to see the needs and characteristics of students. For example, grade VII students are 10-12 years old and are transitioning from elementary to junior high school. However, they are still interested in colors and pictures. This follows the stages of cognitive ability development according to Piaget that at that age is a transition from concrete to abstract thinking (Marinda, 2020). Therefore, developing interesting teaching materials with pictures and colors is necessary.

Design

At this stage, the researcher begins to design the LKS, the components related to the LKS and the instruments to be used. At the planning stage, researchers identify core competencies, basic competencies and indicators of learning material equations and inequalities linear one variable. The LKS design can be seen in Figure 3. Learning activities in the LKS are presented using CTL steps.
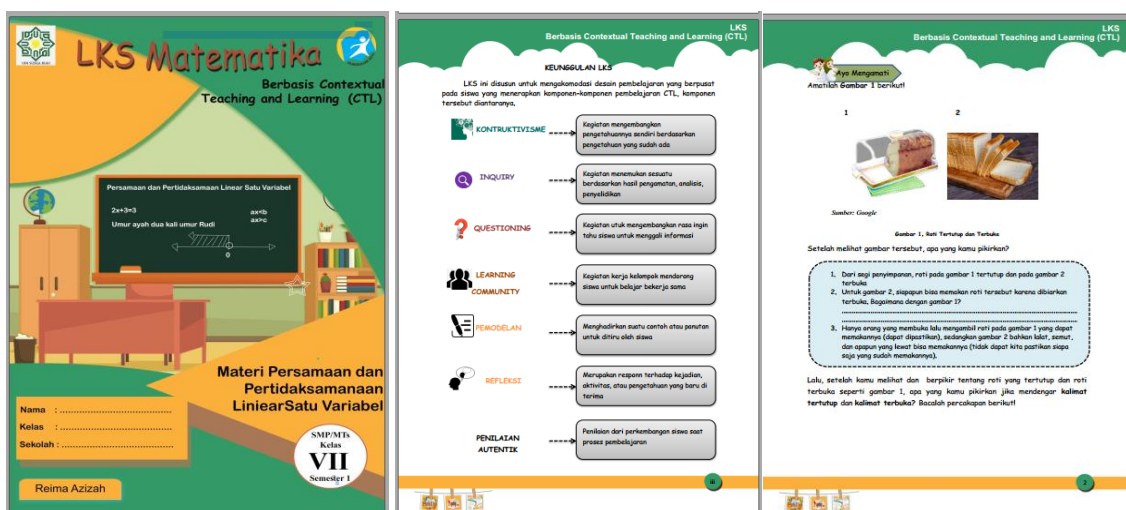
Figure 3. Design LKS

Development

The research instruments that have been designed, namely questionnaires and test questions, were tested in class VIII. The test results of the instrument showed that the questionnaire and test items were feasible to use. After that, a validation test was carried out on the LKS. As a result, LKS are validated by 3 (three) experts in educational technology and learning materials, respectively. The results of the validation test can be seen in the following table:

Table 1. Educational Technology Expert Validation Test Results

No	Validator	Comments/Suggestions
1	Expert I	1. Provide space for more "Activity" students 2. LKS must contain clear, measurable, contained and defined activities
2	Expert II	1. Use symbols that characterize CTL 2. Components of CTL in LKS must be clear
3	Expert III	1. Use equations for writing mathematical symbols 2. Add image source 3. Show all CTL components

Table 2. Learning Material Expert Validation Test Results

No	Validator	Komentar/Saran
1	Expert I	1. It is necessary to clarify the LKS features that reflect the 7 components of CTL 2. Add instructions for using LKS
2	Expert II	1. Adjust the CTL components to the features used, some CTL items are not contained in the elements. Use the appropriate sentence, Let's Observe/read? Re-correct everything that is read and correct according to the CTL component 2. All the student components and the elements in the LKS should be adjusted to chapter II, at least covering anything, change it. Messages or material content has not been able to activate students because there is too much content that does not start students to learn
3	Expert III	1. The CTL component of the LKS needs to be highlighted 2. Use the appropriate sentence in each of the instructions used

In general, the suggestions for improvement are for LKS to highlight the characteristics of the 7 CTL components. The worksheet has been revised according to the validator's suggestions/comments. The questionnaire results show that the percentage of LKS validity from the aspect of educational technology and learning materials is 91.4% and 85.28%, respectively, including the valid category. After the LKS is declared suitable for use, it is continued with the practicality test of the LKS to see the ease of use and legibility of the LKS on 9 grade VIII students. The percentage obtained is 82.73%, including the practical category. This means that this CTL-based worksheet can and is easily used by students for material on linear equations and inequalities of one variable.

Implementation

CTL-based worksheets that have been declared valid and practical are implemented in the experimental group. This worksheet is used by 19 class VII A SMP N 23 first shift students. When learning takes place, the teacher still gives directions or instructions for using the LKS; some students still ask about learning activities in the LKS. However, the role of the teacher during learning has been much reduced; students are more independent and actively discuss to solve the problems presented in the LKS.

Evaluation

The final stage of this development research is evaluation. Researchers evaluate student learning outcomes after using CTL-based worksheets. This evaluation of learning outcomes shows whether the worksheets that have been developed are practical. The following are descriptive statistics of student learning outcomes:

Table 3. Student learning outcomes

Group	N	X_{min}	X_{max}	Ideal Score	$\bar{X}$	Sd
Eksperiment	19	18	27	30	21,74	2,90
Control	19				18,63	2,24

As seen from Table 3, there is an average difference in learning outcomes of 3.11, which is better in the experimental group. However, it is necessary to carry out statistical tests to see the significance of these differences. The tested hypotheses are:

Ho : There is no difference in the average learning outcomes of the experimental and control groups

H1 : There is a difference in the average learning outcomes of the experimental and control groups

Hypothesis testing using t test with a significance level of 95% (α = 0.05). The results of the t-test obtained a significance value of 0.001. This value is smaller than , so Ho is rejected. This means significant differences in learning outcomes between the experimental and control groups. Better learning outcomes in the experimental group indicate that using CTL-based worksheets is effective. As the results of research conducted by Dianita et al. (2016); Gusmiro et al. (2017); Loli et al. (2018); Refianti et al. (2019); Iriani et al. (2021) concluded that CTL-based worksheets are practical for learning mathematics.

Prastowo (2014) revealed that LKS could increase student interest in learning and provide opportunities for students to develop according to their abilities. Hadinurdiana & Kurniati (2018); Majid (2012) state that using LKS helps students develop their mindset independently but still with the teacher's guidance. With the LKS, learning activities become more focused, increase learning motivation, and students are more active and independent.

In its preparation, the activation steps in the LKS must be systematic and precise. The working steps in this worksheet refer to the CTL syntax. The main feature of CTL is a

contextual problem. Contextual problems involving students' experiences in real life make learning more meaningful (ES & Harta, 2014; Lund & Stains, 2015; Sanjaya, 2011; Santoso, 2020). CTL stimulates students to arrange patterns so that they produce meaning by connecting the mathematical context with the context of students' daily lives (Johnson, 2014). This advantage makes CTL-based worksheets effective in learning mathematics.

Conclusion

Learning time restrictions and social distancing require teachers to be able to innovate to create effective and efficient learning in the current new normal era. Student Worksheets (LKS) can be used as an alternative to help smooth learning in class. This development research aims to produce valid, practical and effective CTL-based worksheets. The research and data analysis results showed that CTL-based worksheets were feasible, easy to use, and effective for learning the material on linear equations and inequalities of one variable. In fact, the contextual presented in the worksheets can be adapted to students' social and cultural environment.

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