

## The development of E-LKPD through problem-based learning to improve the sixth grade students' Mathematics mastery

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### ABSTRACT

The purpose of this research was to create a Mathematic LKPD based on Problem Based Learning for the subject of integer arithmetic operations in elementary school. The desire for learning that may improve students' abilities to solve problems, think critically, and inspire curiosity drove the development of this Mathematics LKPD. This was a research and development project (R&D), with data collection and basic research, planning, product development, limited testing, and final product revision being the primary steps. The participants in this study were sixth-grade teachers of SD Negeri 1 Rama Murti located in Seputih Raman district, Central Lampung, Indonesia, with a purposive sampling technique. The research sample consisted of 32 sixth-grade students of the school. Observation and questionnaires were employed to obtain data using a qualitative descriptive analysis. The development of the PBL-based LKPD materials in primary schools was extremely viable to use in learning, according to the findings of the research and debate. This corresponds to the findings of the material experts' validation, the results of the design experts' validation, the results of the media experts' validation, and the findings of the teacher testing.

### KEYWORDS

LKPD; Mathematics; Problem Based Learning;

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## Introduction

Students must manage the knowledge they learn in the twenty-first century by evaluating, assessing, and developing activities. According to Bialik & Fadel (2015), creativity, critical thinking, communication, and collaboration are the skills that students in the twenty-first century must possess. Students must be able to create something new with the information they have gathered, establish reasonable ideas, communicate what they have learned, and collaborate with other students in order to develop more optimal talents. The ability to think critically is one of the abilities that students must have to be able to solve various problems. According to Susanto (2016), critical thinking ability is the ability to analyze something in accordance with the available data or information and find many possible answers to a problem whose emphasis is on quantity, effectiveness, and diversity of answers. Critical thinking is richer than creative thinking. If creative thinking can answer the problems or conditions that dealt with, critical thinking is able to enrich the way of thinking with various alternatives. Critical thinking skills are important for students in solving problems. This is due to critical thinking is a basic ability that must be developed in school.

Ability development is a national education goal, one of which is the ability to think critically. The main task of education is to create individual who is able to do new something. The importance of critical thinking skills is one of the abilities in the world of education. In this case, the low critical thinking ability can be shown from the results of the answers about critical thinking skills that the researcher did when taking the initial data. In the learning process, teachers rarely or never emerge critical thinking skills. The actual teacher during the learning process is good, but the teacher pays less attention to student learning activities that lead to the critical thinking process. teachers have an important role in the success of students of the research. In learning, the teacher not only

transfers knowledge, but the teacher also facilitates learning activities so that students can actively participate in learning activities. Critical thinking is one of the nation's culture and character. Creative learning is also important in improving the quality of learning, and also the competence creativity in terms of learning processes and outcomes.

Mathematics is a subject that encompasses a variety of life demands, including a means of instruction. Mathematics as a tool for teaching has a role in human activities that is derived from the intellectual process, not from experimental outcomes (Damayanti & Mawardi, 2018). Mathematics is utilized to develop thinking and reasoning skills in order to solve problems in the actual world. According to Sriwongchai (2015), mathematics is the science of thinking and a key factor in improving learning potential. This is because critical and creative thinking skills are required to grasp concepts and solve problems in mathematics. The purpose of mathematics does not merely make students able to use mathematics theoretically but also apply it, have the ability to reason logically and critically in problem solving. Observation results indicated that learning is more applying teacher centered approaches, namely teachers as information centers for students, so learning tends to be conventional. This learning pattern is more about the activeness of educators compared to students. In addition, teachers assume that learning in class is only to complete the material in the book. Students are seen as objects not as learning subjects so that students are less active in exploring knowledge. Based on the learning outcomes data, it can be seen that at SDN 1 Rama Murti, from 32 students, 15 students have not reached the minimum completeness criteria (KKM) with an incomplete percentage of 46.68%. Thus, the average student who has not reached the KKM in mathematics is 46.68% and those who have reached the KKM criteria are 53.32%. Based on Depdiknas (2006) This percentage of incompleteness is relatively low because it is thought that learning is successful if at least 75% of pupils meet the minimum completeness criterion.

LKPD is defined as printed teaching materials in the form of sheets of paper comprising materials, summaries, and directions for executing learning tasks pertaining to the Basic Competencies (KD) that must be achieved by participants (Prastowo, 2011). This according to the definition of LKPD and it is in line with (Trianto, 2010) the guideline of student is used to develop cognitive aspects as well as guidelines for developing all aspects in the form of learning guidelines to investigate or solve problems in accordance with learning achievement indicators that must be achieved. (Choo et al., 2011) suggest that LKPD is a learning tool consisting of a series of questions and information designed to understand complex ideas, which guides students to carry out activities systematically.

Based on the results of interviews with sixth grade elementary school teachers at SDN 1 Rama Murti, information was obtained that the use of mathematics worksheets has not been able to optimize students' potential and creativity in mastering mathematical concepts. Besides, learning activities in LKPD were less varied, more dominated by problem-solving activities oriented to logical mathematical intelligence. In fact, every student has a different intelligence. The various descriptions and problems that the researcher has described above, it is necessary to develop Problem Based Learning (PBL)-based LKPD which can improve problem solving skills of critical thinking skills. Having skill in solving problems and fostering a cooperative attitude, independent, thorough and have a great curiosity for something new.

## Research method

This study was of the research and development variety (R&D). The main stages of the steps in research and development refer to Borg and Gall's (1983) research and development. Those steps were as follows: (1) gathering information and conducting preliminary research, (2) planning, (3) product development, (4) limited testing, and (5) final product revision. The population for this study was made up of sixth-grade students from SD Negeri 1 Rama Murti. Purposive sampling was used as a sampling technique. The research sample consisted of 32 sixth-grade students from SDN 1 Rama Murti in the Seputih Raman District. Observation and questionnaires were used to collect data. In this study, the data was analyzed using a qualitative descriptive analysis technique. The findings of the data analysis were used to revise the developed product.

## Results and discussion

Before the product development process, the researcher conducted a preliminary study or needs analysis through distributing questionnaires regarding critical thinking skills to the 32 students of sixth grade of SD Negeri 1 Rama Murti who applied the 2013 curriculum. The questionnaire consisted of 10 statements which were arranged based on aspects of fluent thinking skills, flexible thinking, original thinking, and detailed thinking. Based on the results of the student's critical thinking questionnaire, it was found that 30% of students liked to do experimental activities (including the detailing aspect), while 70% of students did not like to do experimental activities. This is due to experimental or experimental activities in finding mathematical concepts that are carried out are less interesting or too complex. Further, 55% of students did not like to give examples that were different from existing examples (including the original aspect of thinking). This is because students are used to being faced with mathematical problems that are only at the level of knowledge and understanding. Then, 45% of students easily saw mistakes in solving problems (including aspects of fluent thinking). This is because students are not given the opportunity to analyze mathematical problems. Based on the results of the questionnaire, the three indicators above from the ten

indicators in the students' critical thinking ability questionnaire have calculation results below 50%. Students' critical thinking has low ability in the aspects of fluent, original, and detailed thinking.

The results of the LKPD needs analysis were also for sixth grade teachers, which was done by filling out a questionnaire. Based on the results of the questionnaire, there were 70% of teachers who did not make their own LKPD and 100% of the LKPD that was prepared did not contain the LKPD structure (title, study instructions, competencies to be achieved, supporting information, and assessment). LKPD used in schools has not been able to improve students' critical thinking problem solving abilities, LKPD used also did not facilitate differences in student learning styles. Based on the description, these conditions and potentials support developers to develop teaching materials in the form of Problem Based Learning-based worksheets. The LKPD used has not been able to reach the initial product development process based on needs analysis and a study of Core Competencies and Basic Competencies. The LKPD compiled, it would be validated by two material validation experts, two design expert validations and two media expert validations, teacher validation.

LKPD based on Problem Based Learning has been developed after revising suggestions and input from material experts, design experts, media experts and teachers, the final product was obtained in the form of Problem Based Learning-based worksheets for critical thinking skills for sixth grade elementary school students. Then, the result showed that it was very suitable for use in learning. The product developed as a result of the development of LKPD based on Problem Based Learning has fulfilled the concept of learning and learning. According to the constructivist learning theory, learning is the result of students' construction as a result of their interaction with the environment. According to Susanto (2016) referring to the constructivism theory, learning requires students to discover and change complex information for themselves, to compare new information with old rules, and to revise it if the rules are no longer applicable.

According to Vygotsky (as cited in Trianto, 2010), the learning process will occur if the child works or handles tasks that have not been learned, but the tasks are still within his/her reach which is usually called the zone of proximal development, which is a level of development slightly above his ability. Another important idea from Vygotsky is Scaffolding, which is to provide assistance to children at an early stage of development and reduce assistance and provide opportunities for children to take on greater responsibilities after the child can do it. The latest interpretation of Vygotsky's ideas is that students should be given a complex, difficult and realistic task which is then given sufficient assistance to complete the task (Tohir, 2015). As a result, the development of LKPD based on Problem Based Learning is intended so that students can observe, experience, and get information from the LKPD in the form of text, photos, illustrations, or activity stages, enabling students to construct knowledge via their own experiences (see Figure 1).

**LEMBAR KERJA PESERTA DIDIK**

Mata Pelajaran : Matematika  
Kelas/Semester : VII / 1  
Pokok Bahasan : Operasi Hitung Campuran

Kelompok :  
.....

Nama :  
1. ....  
2. ....  
3. ....  
4. ....  
5. ....

**Petunjuk pengisian LKPD :**

1. Baca dan ikuti setiap langkah kegiatan pada LKPD ini.
2. Berdiskusilah bersama teman kelompokmu untuk menyelesaikan masalah-masalah pada LKPD ini.
3. Tanyakan kepada guru bila ada yang kurang dipahami.
4. Gunakan referensi lain seperti buku cetak, internet, dan media belajar lainnya jika diperlukan.

**Tujuan :** Setelah mengikuti serangkaian kegiatan pembelajaran peserta didik dapat:

1. Menentukan operasi hitung campuran bilangan bulat dengan tepat
2. Menyelesaikan masalah kontekstual yang berkaitan dengan operasi hitung campuran bilangan bulat.

1

**OPERASI HITUNG CAMPURAN  
BILANGAN BULAT**

Contoh: ✓ Urutan pengerjaan:  
KURUNG - KA - BA - TA - KU → KURUNG, KALI, BAGI, TAMBAH, KURANG

1.  $(-12) \times 8 + 40 - 10 =$
2.  $(-12) \times 8 + 72 : (-6)$
3.  $80 : (-10) \times 12 - (-20)$
4.  $[(-70) - (-10)] : 10 \times 12 =$
5.  $[120 : (-12)] + [24 \times (-10)] =$
6.  $200 : (-100) \times 123 - 125 =$

@lusiiana amwar

**Aku Pasti Bisa 3**

Ayo, kerjakan di buku tugasmu.  
Selesaikanlah seperti contoh.

1. $30 \times (20 + 3) = \dots$	6. $27 \times (48 - 7) = \dots$
2. $13 \times (18 + 15) = \dots$	7. $45 \times (32 - 10) = \dots$
3. $26 \times (22 - 16) = \dots$	8. $54 \times (13 + 11) = \dots$
4. $31 \times (25 - 14) = \dots$	9. $24 \times (70 - 31) = \dots$
5. $42 \times (65 - 41) = \dots$	10. $18 \times (82 - 20) = \dots$

**B. Operasi Hitung Campuran**

Contoh:  
 $4500 - 30 \times 50 : 3 + 250 = \dots$

Jawab:

- Kerjakan operasi perkalian terlebih dahulu  $30 \times 50 = 1500$
- Dilanjutkan dengan operasi pembagian  $1500 : 3 = 500$
- Dilakukan pengurangan  $4500 - 500 = 4000$
- Operasi penjumlahan  $4000 + 250 = 4.250$

$$4500 - 30 \times 50 : 3 + 250 = 4500 - 1500 : 3 + 250$$

$$= 4500 - 500 + 250$$

$$= 4000 + 250$$

$$= 4.250$$

Jadi,  $4500 - 30 \times 50 : 3 + 250 = 4.250$

Coba kamu hitung kembali dengan kalkulator apakah  $4500 - 30 \times 50 : 3 + 250 = 4.250$ ?

**Aku Pasti Bisa 4**

Ayo, kerjakan di buku tugasmu.  
Selesaikan soal-soal berikut ini.

- $175 \times 18 : 9 + 475 - 250 = \dots$
- $2.400 - 600 : 20 + 40 \times (-35) = \dots$
- $3.425 + 225 \times 16 : 4 - 1.250 = \dots$
- $336 : 12 \times 125 - (235 + 146) = \dots$

c. Meja manakah yang pembagian masing-masing anaknya paling sedikit?  
Jelaskan.

Apo yang dapat kamu simpulkan?

Figure 1. Problem-based E-LKPD for Mathematics mastery

LKPD based on Problem Based Learning is considered very feasible based on material experts, design experts, media experts and practitioners. The results of this study are supported by research conducted by (Utami et al., 2018). The results pointed out that the mathematics worksheets with the Problem Based Learning approach were assessed according to the very feasible assessment. Furthermore, research conducted by (Noer & Gunowibowo, 2018) presents LKPD material for two lessons. The results of the two trials are used as a reference for revising the stage product so as to produce the final product of the Student Activity Sheet for mixed arithmetic operations based on Problem Based Learning. The results of LKPD product development are as follows: First, mathematics contains subject matter with the following basic competencies: solving problems related to arithmetic operations with integers; it can solve problems related to arithmetic operations with integers. Second, LKPD is developed based on Problem Based Learning. Third, the developed LKPD contains indicators of students' critical thinking skills.

What has been explained above has shown that it is important to develop LKPD based on Problem Based Learning. LKPD is considered as motivation to learn and improve students' critical thinking skills. With the help of LKPD, students will attempt to solve a problem given by the teacher. It is very important to formulate sentences about the problem that students will present in an interesting way, related to everyday life so that it is not too abstract, and can be solved by students, either with or without the help of the teacher. The learning process that facilitates students to study in groups and exchange ideas, it will make students accustomed to leading investigations, it is usually started with screening real problems that have been experienced. Based on the explanation above, it can be concluded that the Mathematic LKPD based on Problem Based Learning can be asserted to be feasible to use.

## Conclusion

The development of the sixth-grade students' Mathematics LKPD based on Problem Based Learning on the content of arithmetic operations on integers has given teachers a new option for boosting the classroom teaching and learning process. This development research has produced a problem-based Mathematics LKPD. The LKPD on the arithmetic operation on integers material has been through a validity test by experts. With this validity test, this LKPD has been categorized as valid.

Based on the findings of the study and discussion, it can be stated that the development of the problem-based Mathematics LKPD for elementary schools in Seputih Raman District is extremely practicable to apply in teaching. It can be used as motivation for teachers to use it in the learning process in the classroom. The headmaster can recommend this product to the teachers at the school in the hope that it can be a motivation in designing a Mathematics LKPD in accordance with the student needs. For teachers, based on the validation results, this problem-based Mathematics LKPD can be an option in creating more meaningful learning activities.

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