DEVELOPMENT OF PROBLEM-BASED LEARNING LKPD TO IMPROVE CRITICAL THINKING ABILITY

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Abstract

Students' critical thinking skills are very important in the learning process, because they can affect student learning outcomes. But today the ability to think critically is still a problem for students, especially in learning mathematics. This is because in teaching the teacher still uses conventional methods, does not involve the contextual world, and there are no teaching materials that support critical thinking skills. Therefore it is felt necessary to overcome this problem by developing Problem Based Learning Worksheets, because PBL is a learning model that involves the real world of students in learning and trains students' thinking activities. The purpose of this study is to describe how the development of LKPD and the effectiveness of PBL-based LKPD on critical thinking skills. The type of research used is (R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). Data analysis through expert judgment, and paired sample T test to determine the effectiveness of the model. The results of the material expert's assessment showed that the LKPD that had been developed was in a very appropriate category with a score of 88%, media experts showed a very feasible category with a score of 93%. Meanwhile, learning experts show a very feasible category with a score of 93.5%. The results of the student response questionnaire obtained an average of 98.5% in the very positive category. The average pre-test score was 52.95, while the post-test average was 84.77. And the results of the N-Gain score are 0.7001 in the high category and the N-Gain percent is 0.700084 with the effective category. So, it can be concluded that the use of LKPD in class V at SDN Kradinan 02 is said to be very positive.

Keywords: Critical thinking skills, LKPD, Problem Based Learning

Abstrak

Kemampuan berfikir kritis peserta didik sangat penting dalam proses pembelajaran, karena dapat mempengaruhi hasil belajar peserta didik. Namun dewasa ini kemampuan berfikir krtitis masih menjadi problem bagi peserta didik utamanya dalam belajar matematika. Hal itu disebabkan karena dalam mengajar guru masih menggunakan metode konvensional, kurang melibatkan dunia konstekstual, serta belum adanya bahan ajar yang menunjang kemampuan berfikir kritis. Oleh karena itu dirasa perlu untuk mengatasi masalah tersebut dengan mengembangkan LKPD Berbasis Problem Based Learning, karena PBL merupakan model pembelajaran yang melibatkan dunia nyata siswa dalam pembelajaran dan melatih aktivitas berfikir siswa. Tujuan penelitian ini untuk mendeskripsikan bagaimana pengembangan LKPD serta efektivitas LKPD Berbasis PBL terhadap kemampuan berfikir kritis. Jenis penelitian yang digunakan adalah (R&D) dengan model pengembangan ADDIE (Analysis, Design, Development, Implementation, Evaluation). Analisis data melalui penilaian dari para ahli, dan uji paired sampel T tes untuk mengetahui keefektifan dari model tersebut. Hasil penilaian ahli materi menunjukan bahwa LKPD yang telah dikembangkan kategori sangat layak dengan skor 88%, ahli media menunjukan kategori sangat layak dengan skor 93%. Sedangkan ahli pembelajaran menunjukan kategori sangat layak dengan skor 93,5%. Hasil angket respon peserta didik diperoleh rata-rata 98,5% kategori sangat positif. Hasil penilaian rata-rata pre test 52,95, sedangkan rata-rata post test 84,77. Dan hasil nilai N-Gain score sebesar 0,7001 dengan kategori tinggi dan N-Gain persen sebesar 0,700084 Dengan kategori efektif. Sehingga, dapat disimpulkan penggunaan LKPD di kelas V SDN Kradinan 02 dikatakan Sangat positif.

Kata Kunci: Kemampuan berpikir kritis, LKPD, *Problem Based Learning*

Introduction

Mathematics is one of the branches of science that plays a very important role. When learning math, it definitely requires insight into concepts and theories in problem solving. In learning mathematics, it has several characteristics, namely its abstract objects, its concepts and principles are tiered, and its working procedures manipulate many forms (Widayati, 2019). Mathematics can also train someone on how to think and reason in drawing conclusions. So it is not wrong if a person's thinking ability becomes one of the benchmarks for achieving mathematics learning objectives, especially high order thinking skills, such as the ability to think critically, creatively, logically analytically, and critically (Kusumaningrum, 2012). In addition to training ways of thinking, learning mathematics also trains in terms of solving problems (Suharna, 2013).

One of the thinking abilities that support skills in learning mathematics is critical thinking. Critical thinking can occur when in the process of solving math problems students experience confusion, difficulty, and doubt. Basically, critical thinking is the ability to think by using the knowledge that has been owned to solve problems faced by students in achieving their goals (Fatmahanik, 2018).

Geometry learning cannot be said to be easy and some students may fail to develop understanding of geometry concepts, geometric reasoning and skills in solving geometry problems (Rohimah, 2017). Given this matter, teachers should be able to plan a mathematics learning that is much more interesting and memorable to solve some of the obstacles for students. Teachers can arrange teaching material tools that are more interesting for students, one of which is the preparation of student worksheets (LKPD).

LKPD or student worksheet is a medium in learning that is used to support teaching and learning activities of students who can build their own knowledge with various existing learning resources (Sugiyono, 2016). With the preparation of LKPD or student worksheets, it is hoped that the enthusiasm for activities in learning will grow so that students will be active and creative in solving exercise questions in mathematics.

Based on observations made by researchers at SDN Kradinan 02, precisely in grade 5, there are several factors that cause students' critical thinking skills to be quite low, including that students have not been able to think critically so that they only focus on the theories conveyed by the teacher with the application of questions that are still quite easy. And teachers do not fully involve students in critical thinking activities and also the media or teaching materials used do not have the latest innovations that can attract students' attention in learning mathematics.

In addition, the results of an interview with one of the mathematics teachers or grade 5 teachers, namely Mrs. Hermia, stated that at school there is no special LKPD that can improve students' critical thinking skills so that the books used by teachers from theme books or packages include questions in the book as exercises. In addition to the selection of LKPD or student worksheets that can support learning, then in learning mathematics must be balanced with the application of learning models that can improve students' understanding and their critical thinking skills, one of which is the Problem Based Learning model (Kemendikbud, 2013).

The Problem Based Learning (PBL) model is one of the learning models that invites students to find the right solution to problems in real life (real world). The problems presented in the Problem Based Learning (PBL) model are expected to be able to increase the curiosity of students in the teaching and learning process in the classroom and especially improve critical thinking skills (Arsil, 2019). Based on this background, the purpose of this study is to examine how the development of LKPD can improve students' critical thinking skills.

Method

This study uses the R&D (research and development) development model. The procedure used refers to the ADDIE development model (Analysis, Design, Development, Implementation And Evaluation) (Branch, 2009). The validation design used in this development research is the validation of material experts, media experts and learning experts and fifth grade teachers. The object of the trial in this study was grade V students of SDN Kradinan 02 who learned the material of geometry in the form of volume of cubes and blocks. The assessment instrument is a Likert scale questionnaire by giving a check mark (√) with alternative answers Very Good (5), Good (4), Sufficient(3), Insufficient (2), Highly Insuffiecient (1). This assessment instrument is to determine the impact and effectiveness of learning media in the form of LKPD on students' critical thinking skills. Tests were conducted on 22 students consisting of 9 boys and 13 girls.

Data collection techniques in this study used questionnaires and tests to determine the assessment of material experts, media experts, and learning content experts, as well as to see students' responses to the development of problem-based learning of LKPD teaching materials. Data analysis techniques in this study used descriptive statistical analysis techniques. Through prerequisite tests, namely normality test, homogeneity test, Paired Sample T test and N-Gain Test to determine the effectiveness of LKPD using the IBM SPSS 25 program.

Result and Discussion

This research has produced a product in the form of teaching materials o LKPD (Learner Worksheet) based on Problem Based Learning. This LKPD was developed using the CANVA application. The material presented in this LKPD is space building material focused on the volume of cubes and blocks. This development research uses the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation).

At the analysis stage, analysis of needs is carried out which includes three things, namely analyzing the characteristics of students and learning problems, analyzing competencies, analyzing facilities and the school environment. In this analysis, several obstacles were found such as the mathematics learning process in class V tends to be conventional. In addition, teachers are rarely seen using innovative teaching materials, where the teaching materials used are only limited to textbooks.

Competency analysis consists of basic competencies and indicators of competency achievement. The basic competencies contain two main points, namely First, (3.5) Explain and determine the volume of a space using volume units and the relationship between the power of three and the cube root. Second, (4.5) Solve problems related to the volume of a space using volume units involving powers of three and cube roots. In the analysis of School Facilities and Environment aims to support the smooth learning process, so that when the facilities in the classroom are met and students feel comfortable, the learning process will be carried out well too.

At the Design Stage (Design) aims to produce an initial design of the developed LKPD. Including Media Selection, where the media that researchers feel is appropriate to apply is print media, because of its more practical, direct, touchable and easily accessible characteristics. Accordingly, the teaching media or printed teaching material that is recommended and selected is LKPD (Learner Worksheet). And Format Selection, at this stage the LKPD material of cube and block volume is adjusted to the components of problem-based learning (PBL), namely cover, syllabus, learning instructions, apperception material, problem-based learning material, practice questions and competency tests. And ends with a closing

section in the form of a bibliography and a back cover containing the biodata of the LKPD author.

Initial Design, at this stage, the LKPD is made using the CANVA application and Microsoft Word 2013. The following are the results of learning media development:

a. Cover and Syllabus Page

Gambar 1. Cover and Syllabus Page

LKPD cover, the identity column consists of name, class and attendance number. And there is also the identity of the LKPD such as information on the subject, class/semester, school year and subject matter. The LKPD syllabus page contains basic competencies, learning objectives and indicators in accordance with the 2013 curriculum based on the Regulation of the Minister of Education and Culture Number 37 of 2018.

b. Learning Intrucctions Page

Gambar 2. LKPD Instructions Page

On the LKPD instructions page contains learning instructions such as praying activities, preparing stationery and brief apperception activities.

c. Let's Observe page (Cube and Block Apperception)

Gambar 3. Cube and Block Apperception Page

On this page only a few pictures are given, which contain an explanation of the mathematical concept of cube / block material or its nature repeats the previous material (apperception). In this page students are invited to remember the previous material and relate it to real life.
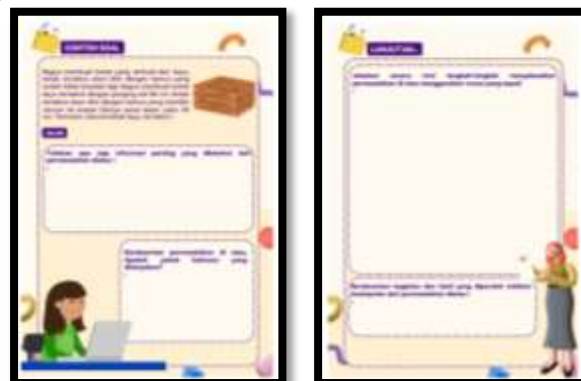
d. Volume of Cubes and Blocks Page

Gambar 4. Volume of Cubes and Blocks Page

On this page, students are directed to find the concept of volume of cubes and beams from story problems in the form of problems in everyday life. This aims to foster critical thinking skills in students.

e. Sample Question Page

Gambar 5. Sample Question Page

At this stage, researchers together with students apply the concept of volume of cubes and beams that have been found previously to the exercise problem. The exercise problem above is presented along with an answer filling column based on Problem Based Learning (PBL) and contains indicators of critical thinking skills.

f. Work Steps Page and Competency Test Page
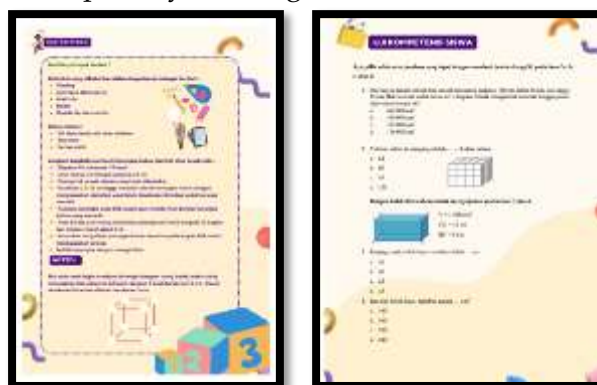
Gambar 6. Work Steps Page and Competency Test Page

On this page the teacher invites learners to make a masterpiece in the form of a cube or block building frame. With tools and materials and work steps that have been listed as above. On the Competency test page contains assessment questions consisting of two types, namely multiple choice questions consisting of 10 questions and description questions with a total of 5 questions.

g. Assessment Rubric Page, Bibliography, and Author's Curriculum Vitae
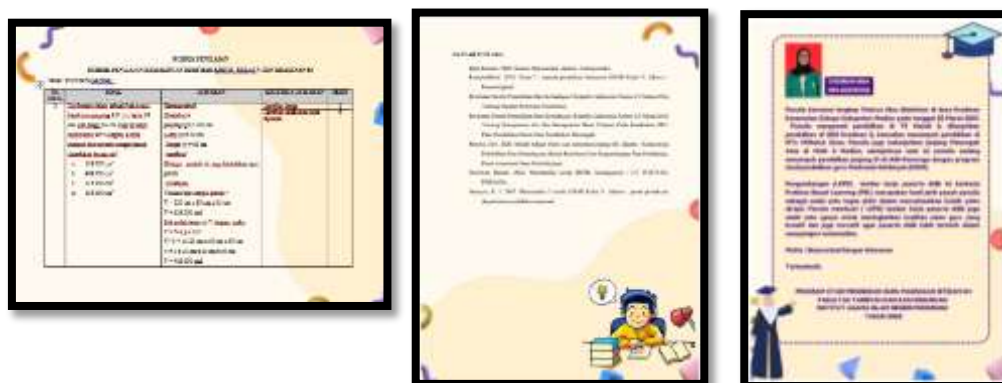
Gambar 7. Assessment Rubric Page, Bibliography, and Author's Curriculum Vitae

This assessment rubric page is only in the teacher's handbook. Answer and Score Criteria. The bibliography page contains references to sources or references used in the preparation of LKPD. The back page is the author's bio, education history, author's photo, life motto, and the purpose of making LKPD.

At the Development Stage, there are several things that are done such as Making Learning Media. The media that had previously been designed in the form of a prototype, was further developed by researchers. This media was developed using the CANVA application. And Product Feasibility Validation, this validation is carried out after the learning media is completed. Validation of learning media or LKPD is carried out by expert validators and mathematics teachers. Expert validators consist of media expert validators, material experts, and learning experts.

a) Material Expert Validation

Table 1. Material Expert Validation

Aspect	Validator			Percentage	Category
	1	2	3		
Content aspect / material	42	35	37	84%	Very Feasaible
Average				4,2	
Learning content aspect	46	42	50	92%	Very Feasible
Average				4,6	
Average of each validator	4,6	4,05	4,5		
Overall average		4,4			88%
Category				Very Feasible	

From the data above, the average percentage of the feasibility of material experts 1, 2, and 3 is 4.4 and the percentage is 88% with the category Very feasible to use.

b) Media Expert Validation

Table 2. Media Expert Validation Result

Aspect	Validator			Percentage	Category
	1	2	3		
Technical Quality Aspect	54	49	55	89%	Very Feasible
Average				4,8	
Design Quality Aspect	19	16	20	92%	Very Feasible
Average				4,5	
Average of each validator	4,9	4,3	5,0		
Overall Average		4,65			93%
Category				Very Feasible	

From the data above, the average obtained from the results of the percentage of the feasibility of media experts 1, 2, and 3 is 4.65 and 93% percentage with the category Very feasible to use.

c) Validasi Ahli Pembelajaran

Table 3. Hasil Validasi Ahli Pembelajaran

Aspect	Validator			Percentage	Category
	1	2	3		
Characteristics (PBL)	24	20	25	92%	Very Feasible
Average				4,6	
Principles (PBL)	19	18	20	93,75%	Very Feasible
Average				4,75	
Average of each validator	4,8	4,2	5		
Overall Average		4,675			93,5%
Category				Very Feasible	

From the data above, the average obtained from the results of the feasibility percentage of learning experts 1, 2, and 3 is 4.675 and the percentage is 93.5% within the category of very feasible to use. After being validated by material experts, media experts, and learning experts. Then the shortcomings of the LKPD that have been developed can be known. After that, revisions were made to the product. As for some suggestions and input by material experts, media experts and learning experts are related to the use of punctuation in LKPD that is not correct, errors in word writing, use of sentence structure, selection of media design, use of supporting animation, font type, font size and media color.

As for some suggestions and comments on improvements provided by media experts, material experts and learning experts as well as grade V teachers as above, they have been

carefully considered and pay attention to the main target as users of LKPD, namely grade V students at SDN Kradinan 02. At the Implementation Stage, researchers conducted product trials on grade V at SDN Kradinan 02 with a total of 22 students by looking at students' responses or responses to the learning media that had been developed.

The results of the students' questionnaire response to the LKPD (Learner Worksheet) can be seen as follows:

Table 4. Student Response Questionnaire Assessment Results

Aspect	Percentage	Category
Content aspect/material	99%	Very Positive
Average		4,95
Media Aspect	98%	Very Positive
Average		4,92
Overall Average		4,935
Overall Percentage		98,5%
Category		Very Positive

From the final results shown in the table above, the average percentage obtained is 98.5% and is included in the Very Positive category. Furthermore, the LKPD effectiveness test on students was carried out using the paired sample T test. The data on the results of the pre-test and post-test are presented in the table below, as follows:

Table. 5 Pre Test and Post Test Assessment Result

Descriptive	Mean	Median	Variance	Std. deviation	Min	Max
Pre test	52,95	55.00	139.665	11.818	35	70
Post test	84,77	85.00	110.660	10.520	70	11

The table above shows the descriptive value of each variable, namely, the pre-test has an average value (mean) of 52.95. While the post test has an average value (mean) of 86.14. The data distribution obtained is 10,520 with a standard error of 1,770. This shows that the post test data is higher than the pre-test. Based on this data, students have experienced an increase in their critical thinking skills. From the data on the results of the pre test and post test, it can be analyzed using the Pre-Requisite Test in the form of Normality Test and continued with the Homogeneity Test, Paired Sample T Test and N-Gain Test to determine the level of effectiveness.

Normality test is used to determine whether the data is normally distributed or not. In the second output, namely the results of the normality test, the pre-test data has a significance value of 0.150 and the post-test significance value is 0.200. Because the significance is more than 0.05, so the pre-test and post-test data are declared Normally Distributed. From the homogeneity test results obtained sig. of 0.512. Because the sig. value is greater than the α value of 0.05, the decision taken the variance of the two data is homogeneous. From the mean value, it can be seen that the average already applied LKPD of 84.77 is higher than before applying LKPD. Furthermore, the results of the N-Gain value test, the mean value obtained is 0.7001, which means the effectiveness is high. Then for the N-Gain percent, the mean value obtained is 70.0084. Then the interpretation is effective. With this it can be concluded that the use of Problem Based Learning based LKPD in class V SDN Kradinan 02, can improve critical thinking skills or said to be Very Effective.

At the evaluation stage, it is carried out with the aim of validating the product in the form of LKPD (Learner Worksheet) which has been developed through expert testing and

product testing. At each stage of the development of this learning media there are evaluations and revisions made to improve the resulting product. Considering several evaluations of the implementation that has been carried out by researchers, then it will be taken into consideration and learning for the future can be even better.

This LKPD development activity should be a valuable opportunity for teachers and researchers especially to explore the critical thinking skills of learners. This is in accordance with Sumiati and Asra (2007) that the discovery of concepts by students themselves will make concepts longer remembered. Learners will find it easier to find their own concepts if the LKPD presented is related to phenomena that are concrete, simple and related to the concepts being studied.

Designing or compiling a learning media for elementary school children, namely LKPD (Learner Worksheet) as one of the interactive learning media can be utilized by teachers and students in the learning process. This is intended so that students can learn independently and to invite students to think critically (Novelia, 2017). The initial activity of making LKPD learning media is to determine what material is appropriate and will be used as the subject matter in making learning media. The material that feels right for the subject matter of the LKPD according to the researcher is the volume of space in the form of cubes and blocks, which contains text and graphics.

The selection of this material is based on the material in class V SDN Kradinan 02 in even semester learning and prioritizes mathematics subjects, because it considers the difficulty of students in understanding concepts, especially in applying formulas to story problems, which have an impact on critical thinking skills. This LKPD is equipped with several main components, namely, cover page, syllabus page (basic competencies, core competencies, learning objectives), critical thinking skills and PBL (Problem Based Learning) linkage page, learning instructions page, cube and beam material apperception page, cube and beam volume formula discovery page, sample problem page, work steps page, competency test page, assessment rubric page, bibliography page and author's bio page. These components that are poured by researchers in LKPD, have been adjusted to the LKPD components according to the theory of Widyantini, namely title, subject, semester, place, learning instructions, competencies to be achieved, indicators to be achieved by students, supporting information, tools and materials to complete tasks, work steps, and assessment.

Based on observations made by researchers, it appears that students are interested in the LKPD, especially because the LKPD has an attractive design with cartoon illustrations and animations that are of interest to children. This is evident from the students' response questionnaire sheet with very positive response results from a total of 22 students with a percentage of 98.5% very positive category. The selection of printed LKPD learning media is tailored to the needs of class V at SDN Kradinan 02, namely in achieving learning objectives and improving critical thinking skills that are adjusted to the success indicators. Which is in accordance with Facion's theory, namely interpretation, analysis, evaluation, inference (Facion. 2013).

Based on the results of the LKPD product trial in the classroom, the final results of the student response questionnaire score obtained a very positive response percentage of 98.5% and the final score of the Pre Test and Post Test through several stages of normality test, homogeneity test and T test. And obtained Pre Test has an average value (mean) of 52.95. While the Post Test has an average value (mean) of 84.77. So that LKPD can improve critical thinking skills or said to be Very Effective to be applied.

Students and teachers also give opinions on this LKPD, that with the application of learning media this makes it easier for students to analyze and understand the content of the material they see from real problems (real life). In addition, students can also foster their critical thinking skills through each stage in solving the problems provided..

Conclusion

Based on the results of research and development of LKPD learning media, it can be concluded that (1) The process of developing learning media for Problem Based Learning (PBL)-based Learner Worksheets (LKPD) to improve critical thinking skills using the ADDIE development model (analysis, design, development, implementation, evaluation); (2) Obtained data from the results of the learner response questionnaire with an average percentage of 98.5%, stating that the participant's response or response to the LKPD developed was very positive; (3) Obtained assessment results from 22 students, with an average Pre Test of 52.95, while the Post Test average was 84.77. So, it can be concluded that the average assessment results increased by 31.82. Thus, the use of LKPD in class V SDN Kradinan 02 is said to be very effective..

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