

DEVELOPMENT OF E-LKPD WITH PBL APPROACH AND BASED ON JAMBI CULTURE TO IMPROVE STUDENTS' MATHEMATICAL COMMUNICATION SKILLS

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ABSTRACT

The low mathematical communication skills of students should be the main issue that should be of concern to an educator. Learning should be designed through problems that allow students to be able to do better mathematical communication. This study aims to produce an E-LKPD with a Problem-Based Learning approach based on Jambi culture with valid, practical, and effective quality to improve students' mathematical communication skills. The subject of this research is class VIII MTsSBustanulUlum in even semester 2023/2024. This type of research is Research and Development with the ADDIE model. The results of this study indicate that the quality of E-LKPD developed has valid, practical, and effective categories. The validity can be seen from the results of expert validation in the field of media and learning materials which show that E-LKPD is good and feasible to use, practicality can be seen from the perceptions of students and teachers who give positive responses to the E-LKPD developed and effectiveness can be seen from the increase in students' mathematical communication skills by comparing the pre test and post-test scores with the N-Gain test with an acquisition of 0.50 with a moderate category. Thus to improve students' mathematical communication skills can use E-LKPD with a problem-based learning approach based on the Jambi culture that has been developed.

Keywords: Jambi culture, E-LKPD, Mathematical communication skills, Problem based learning.

Introduction

Mathematics learning has the goal of communicating ideas or arguments in tables, diagrams, tables, media, or symbols to clarify situations or problems. Communication skills have a role in achieving the goals of mathematics lessons by students (Nasri & Jamaan, 2022).

A number of mathematical skills, including problem-solving, reasoning and proof, communication, connection, and representation, need to be developed during the mathematical learning process, according to the National Council of Teachers of Mathematics (2000) (Anggraini et al., 2022). The learning objectives of mathematics in the 2013 curriculum, include the following: (1) students can understand mathematical concepts; (2) explain the relationship between concepts; and (3) apply concepts or

algorithms flexibly, accurately, efficiently, and precisely in problem-solving, are in line with the five standards of mathematical ability according to NCTM (Utami & Amidi, 2022).

Mathematical communication skills are one of the higher-order thinking abilities that must be acquired during the mathematics learning process. The capacity of pupils to communicate mathematical concepts both orally and in writing is known as mathematical communication abilities. The school learning process, which includes the mathematics learning process, can help students enhance their mathematical communication abilities. This occurs as a result of the fact that logic is a branch of mathematics that helps improve pupils' critical thinking abilities. Therefore, the development of mathematical communication abilities is greatly aided by mathematics (Hodiyanto, 2017).

Actually, pupils still have poor communication abilities when it comes to mathematics. The findings of Osterholm's research (Nuraeni&Luritawaty, 2016) demonstrate this, indicating that students appear to struggle with explaining why they understood a reading. Students occasionally just concentrate on a small portion of the text and claim that this section (issues that contain symbols) does not comprehend when asked to provide logical reasons for their comprehension. However, they do not offer any supporting evidence for their claims. According to the findings of Sriwahyuni's research (Firdaus & Aini, 2019), 65% of pupils still have poor mathematics communication abilities (Hanipah & Sumartini, 2021).

Realizing the importance of mathematical communication skills, one of the efforts is through learning that makes students interested in learning. To foster this mathematical communication ability, it is necessary to design a teaching material. The teaching materials used are student worksheets. LKPD is better known as student worksheets (LKS). The use of the word LKS is more dominant than LKPD (Andriyani et al., 2020).

Problem-based learning (PBL) can be used as a means to train students' communication skills. This is reinforced by the opinion of Duch, et al (2001); Boud (Savin-Baden & Major, 2004) and Ali, et al. (2010) who stated that one of the abilities that can be developed and become the focus of learning with PBL is communication skills (Ningrum, 2017). To improve communication skills, one of the alternatives that teachers can use is to use culture as a learning subject.

Research Method

Research and development, or R&D, is the term used to refer to the research that has been done. A number of phrases are used in research and development, and one of them makes use of the term ADDIE, which refers to the model that serves as a guide for instructional design projects. The anticipated outcome of this study is an E-LKPD that may enhance the mathematical communication abilities of class VIII MTsMBustanulUlum pupils using flat-sided space construction material. It incorporates a problem-based learning method and incorporates Jambi culture. Figure 1 below illustrates the phases in the development process using the ADDIE model as described by (Branch, 2009):

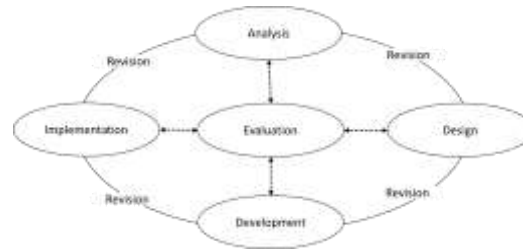


Figure 1
Steps of the ADDIE Development Model

1. Analyze stage

The analysis stage is an early stage of planning, which is about thinking about the new product to be developed. According to (Branch, 2009), the purpose of this analysis stage is to be able to identify the possible causes of the gaps that occur.

At this stage of curriculum analysis, it is useful to know the curriculum that applies in the school where the researcher will conduct the research. Furthermore, the performance gap analysis, this performance gap is to be able to produce a statement of the basic objectives to be able to establish an implementation gap related to the problem, find out the cause, and find a solution to the existing gap. As for setting a goal by identifying the actual gap and also confirming the expected performance, then find the main cause of the performance gap and choose the priority of an action. Based on the problems that have been found by researchers, researchers determined that the priority of action is to develop Electronic-Learner Worksheets (E-LKPD) with a Problem-Based Learning (PBL) approach based on Jambi Culture.

2. Design Stage

At this stage, a product design will be carried out in the form of electronic learner Worksheets (E-LKPD) with a Problem-Based Learning (PBL) approach based on Jambi Culture. The material that will be presented in this learning media is based on the basic competencies of flat-sided space-building material. Design validation can also be done by presenting several experienced experts or experts to assess the new product that has been designed.

3. Development Stage

After the E-LKPD is completed, there is the next step, namely the development stage, the product that has been made is then validated so that it meets the quality criteria that are acceptable. Validation is a process of activities to assess whether a product design in this case will rationally be more effective than the old one or not.

According to (Branch, 2009), formative evaluation is the process of collecting data that is used to revise before implementation. There are 3 stages in the formative evaluation section, namely individual trials, small group trials, and large group trials.

4. Implementation

In this part of the implementation stage, there are steps to apply the product of the developed product. According to (Branch, 2009) at the implementation stage, the products that have been tested are applied in real situations with real teaching using E-LKPD with a Problem-Based Learning (PBL) approach and based on Jambi culture. This research was conducted at MTsSBustanulUlum Class VIII.

5. Evaluation

In the evaluation stage, several stages are also carried out, namely the evaluation stage carried out by media experts and material experts through the product validation process, then continued by revising the product based on the assessment and suggestions from learning and media design experts and material experts as well as the results of product trials and validation that have been carried out in small groups of 6 students. Furthermore, it was tested on a large group of 15 students.

(Branch, 2009) says that there are 3 evaluation criteria in the ADDIE model, namely:

Level 1: Perception

Level 2: Learning

Level 3: Performance

In this teaching material development research, researchers only carry out up to level 2 stages in this ADDIE model evaluation, namely level 1 (perception) and level 2 (knowledge). So researchers do not need to carry out level 3 evaluation, namely measuring the knowledge and skills of students applied in an authentic work environment.

Result and Discussion

There are results of this study, namely (1) an electronic student worksheet (E-LKPD) with a problem-based learning approach based on Jambi culture to improve students' mathematical communication skills, (2) assessment by material experts, media experts on mathematics E-LKPD that has been made, (3) teacher responses and student perceptions of the use of E-LKPD obtained from questionnaires and have been validated by instrument experts, and (4) student learning outcomes (post-test) on the use of E-LKPD with Problem-Based Learning Approach and Jambi Culture Based to improve students' mathematical communication skills.

The types of data taken in this study are qualitative data and quantitative data. Qualitative data is obtained from the results of material expert validators and learning and media design experts, then there are responses from mathematics teachers, and the results of student response questionnaires on learning media that have been made, while quantitative is obtained from student learning outcomes through post-test (final test).

The E-LKPD developed in this study was developed with the ADDIE model (Analyze, Design, Development, Implement, and Evaluation).

At the Analyze Stage, what must be done by researchers to develop a media is curriculum analysis, obtained information that MTsSBustanulUlum Tanjung Jabung Timur in class VIII still applies the 2013 curriculum, and for class VII already uses the independent curriculum (latest). Next, in the performance gap analysis at this stage, the researcher asks for responses from colleagues (other teachers) at MTs.SBustanulUlum with the aim of knowing more clearly the problems that exist that cause gaps to occur. This was done by giving observation sheets to math teachers who teach at the school. After analyzing the performance gap and knowing the existing problems, the next step at the analysis stage is to set goals, based on the observations of researchers and the results of observations, it is known that the gaps that occur or real conditions include students being less interested in the LKPD they use due to the lack of material and learning steps that are difficult to follow, it should be in ideal conditions or expected conditions that students are interested in the LKPD they use because if students are

interested in the material taught using LKPD, students will find it easy to understand and also be active in their learning. Based on this, the goal set is that researchers develop E-LKPD using a problem-based learning approach based on Jambi culture to improve students' mathematical communication skills using web-based assistance, namely live worksheets.

At the Design Stage, researchers must design E-LKPDs with a problem-based learning approach based on Jambi culture to improve students' mathematical communication skills on flat-sided space-building material. The design or storyboard in making a media is important to do so that the media made is in accordance with what is needed. At this stage, researchers design products in the form of E-LKPD with a problem-based learning approach based on Jambi culture. The initial stages carried out to design E-LKPD are collecting information related to material from various sources, such as books, the internet, or other learning media. The results of the E-LKPD design can be seen in the following figure:



Figure 2
E-LKPD Cover

The results of the LKPD cover design contain the identity of the LKPD, namely the title of the LKPD “Mathematics Learner Worksheet; Flat-Sided Spaces Based on Jambi Culture; SMP / MTs ClassVIII”. The author also includes the author's identity and symbols of the author's institution, namely the University of Jambi, and images of related Jambi cultures.



Figure 3
Concept Map

On the concept map page or the sequence of material that students will learn during the learning process on flat-sided space building material. concept maps make it easier for students to know the overview in learning flat-sided space building material in general.



Figure 4
Description of E-LKPD

In this section of the page, the description of the student worksheet with the PBL approach and based on Jambi culture.



Figure 5
E-LKPD Instructions

This section of the page contains learning instructions for teachers and students in using student worksheets with a PBL approach based on Jambi culture.



Figure 6
E-LKPD Materials and Activities

This page contains material and learning sequences based on PBL learning steps and presents Jambi cultural objects as an interesting combination.

Furthermore, the E-LKPD that has been designed is validated by experts in their fields. The validation carried out in this study is material validation and media validation. The experts chosen for validation are in accordance with the consideration of expertise, expertise, and experience in the development of teaching materials in the form of E-LKPD and flat-sided space building material so that the advantages and disadvantages of the E-LKPD design that has been made can be known.

The material expert validator in this case by Mrs. Dr. Nizlel Huda, M.Kes against E-LKPD with Problem Based Learning approach and based on Jambi culture on the material of flat side space building in class VIII MTsSbustanulUlum which has been developed by filling out an open assessment consisting of 14 questions.

Based on the results of the material expert assessment, the results showed that each statement given by the material expert gave a very good and appropriate response to the overall E-LKPD material developed after undergoing repeated revisions.

Media expert validator in this case by Dr. Dra. Zurweni, M.Si against E-LKPD with Problem-Based Learning approach and based on Jambi culture on the material of flat-sided space building in class VIII MTsSbustanulUlum which has been developed by filling out an open assessment consisting of 17 questions.

Based on the results of the material expert assessment, it was found that each statement given by the media expert gave very good and appropriate responses to all components of the E-LKPD developed after undergoing repeated revisions.

Using the Problem-Based Learning technique and the framework created during the design stage, researchers started developing E-LKPDs in development. These were built in response to feedback and recommendations from the expert validation process. Product testing will be carried out at this point. There are three phases to this product trial: individual, small group, and big group (field tryout) trials. An individual experiment was carried out with a math instructor employed at MTsSBustanulUlum. Finding out the initial thoughts and suggestions for the E-LKPD that had been created was the aim of this single study. The task assigned to the subject was to watch and evaluate the E-LKPD using a problem-based learning methodology and Jambi culture in relation to the flat-sided space construction material as a whole. Researchers provided each study participant with a questionnaire so they could provide an evaluation. There are sixteen questions on the survey, and each question has an indication. The indicators include content feasibility, language, usage effectiveness, and visuals.

Based on the researcher's analysis of the individual trial responses overall the subject's assessment of the E-LKPD developed is very positive and good, but there are suggestions given by the subject so that the E-LKPD developed can be better, namely improving a little on the description of the presentation and the size of the type of writing the size of the writing written in questions number 10 and 14. His point is that E-LKPD as a student learning resource can be more easily understood to be studied and analyzed by students. Thus, it can bring out good comprehension skills for students.

A small group trial comes after the solo trial. Six students in class VIII MTsSBustanululum Tanjung Jabung Timur participated in this experiment; their low, medium, and high skills were determined by the mathematics instructor who instructed

the class. Using the URL that the researcher has created, students can open the E-LKPD immediately. Students are also required to complete an extensive observation of the E-LKPD and provide an assessment in the form of their answers to the created E-LKPD. Two indicators and fourteen question items make up the small group trial questionnaire. Based on student responses, it can be concluded that small group trials conducted by S1, S2, S3, S4, S5, and S6 gave positive comments and they were interested in learning using E-LKPD with a problem-based learning approach and based on Jambi culture.

based on the trial participants' small group comments. Overall, it can be said that the E-LKPD was created as a useful learning tool and that its delivery language is simple to comprehend. The E-LKPD's appearance piques students' interest in learning, and its easy-to-understand material presentation coupled with exercises involving HOTS questions can also stimulate students' curiosity. The program's learning steps can also pique students' curiosity, and its exercises align with the material for building flat-sided spaces. Moreover, the E-LKPD can motivate students to participate actively in their education, serve as a resource for independent study, and help students better understand and apply the material to their daily lives.

A big group trial comes after the small group trial. Fifteen pupils from class VIII A MTsSBudtanulUlum participated in this trial. Following the observation of the E-LKPD on each participant's smartphone by the whole large group trial, the students' replies to the E-LKPD were used as an assessment tool.

Students' responses to the E-LKPD were gathered through a questionnaire used for assessment purposes. Based on the replies from the students, it can be inferred that of the fifteen respondents, all of them expressed interest in studying using E-LKPD utilizing a problem-based learning strategy based on Jambi culture.

based on an examination of the test takers' extensive group replies. Overall, the E-LKPD developed is a good learning resource; the language used in it can encourage students to communicate; the material's appearance is engaging; the material's presentation is simple to understand and can help students' mathematical communication skills; the exercises in it align with the flat-sided space building material; the material's easy to understand presentation can also motivate students to participate in their education; and finally, the E-LKPD can be used as a self-directed learning tool for students, and make students easier to understand flat-sided space building material and can be applied in everyday life.

At the Implementation Stage, products that have been tested are then applied in actual situations with actual teaching using E-LPDs with a Problem-Based Learning approach and based on Jambi culture involving 22 subjects of class VIII B MTsSBustanulUlum East Tanjung Jabung. Learning activities were carried out for 2 meetings. Each meeting in this learning is carried out in 2 activities, namely opening, core activities, and closing activities. Each student uses a web-based application that can be opened on their respective smartphones containing E-LKPD with a problem-based learning approach and based on Jambi culture for flat-sided space building material. The E-LKPD student handbook consists of several learning steps with problem-based learning, namely orienting students to problems, organizing students to learn, guiding individual or group investigations, developing and presenting work, and analyzing and evaluating the problem-solving process. Before the implementation, a pre-test was

conducted, which is an activity that tests students' initial mathematical communication skills. At the last meeting after completing the learning for flat-sided space building material, researchers conducted a post-test to measure students' mathematical communication skills.

In evaluation, researchers measure the final competence of the subject or learning objectives to be achieved. Evaluation is carried out after the learning activities end then the evaluation results are obtained as feedback for researchers. At this stage, the effectiveness of the E-LKPD that has been used for real classroom learning will be seen.

This evaluation is carried out with a questionnaire to determine student perceptions and tests after completing the learning process. From the evaluation, the results will be obtained in the form of E-LKPD which is said to be effective if the media is positively perceived by students and the objectives of this E-LKPD development are achieved, namely improving students' mathematical communication skills on flat-sided ruan building material.

The student perception questionnaire was conducted after students understood what was contained in the E-LKPD. The questionnaire consists of 2 indicators with 14 items. A recapitulation of student perception assessments can be seen in the following table:

Table 1
Recapitulation of student perception assessment

Questions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Number of points	110	106	103	108	105	107	109	107	105	108	104	108	104	108	1492
% (grain)	100%	96%	94%	98%	95%	97%	99%	97%	95%	98%	95%	98%	95%	98%	97%
Category	Very good														

Based on the results of the analysis in the table above, show that the perception of class VIII B students towards E-LKPD with the Problem-Based Learning approach and based on Jambi culture at MTsSBustanulUlum obtained an average overall score of 67.8. So it can be concluded that the overall average score is categorized as very good.

Then the results of the Pre-test and post-test were analyzed with scoring guidelines which had also been validated by previous experts based on indicators of mathematical communication skills. The results of the pre-test and post-test from the implementation stage on the Flat-Sided Spaces material can be seen in the following diagram image 7 below:



Figure 7

Diagram of Pre-test and Post-test Results

There is a comparison table of pre-test and post-test results according to the table in Figure 7.

Table 2
Comparison of pre-test and post-test results

No	Pre-Test Score Range	Number of Students	Post-test Score Range	Number of Students
1	$0 \leq Skor \leq 3$	1	$0 \leq Skor \leq 3$	0
2	$4 \leq Skor \leq 7$	1	$4 \leq Skor \leq 7$	0
3	$8 \leq Skor \leq 11$	11	$8 \leq Skor \leq 11$	0
4	$12 \leq Skor \leq 15$	3	$12 \leq Skor \leq 15$	5
5	$16 \leq Skor \leq 19$	6	$16 \leq Skor \leq 19$	12
6	$20 \leq Skor \leq 22$	0	$20 \leq Skor \leq 22$	5
Total Pre-Test Score		22	Total Post-Test Score	22
22 Students = 256			22 Students = 384	

It can be analyzed from the table and diagram above that the total of the pretest results is 256 and the total of the post-test results is 381 based on the results of the pre-test and post-test which are analyzed by the g-factor formula (N-gain) developed by Hake, the result is 0.5 and can be interpreted that there is an increase in students' mathematical communication skills in the medium category. This is also supported by the positive response of students after learning using the E-LKPD that the researcher made.

As a result, the pupil's ability to communicate mathematical ideas has improved. The figure below shows the score of the indicators of mathematical communication abilities for students based on the examination of those indicators:

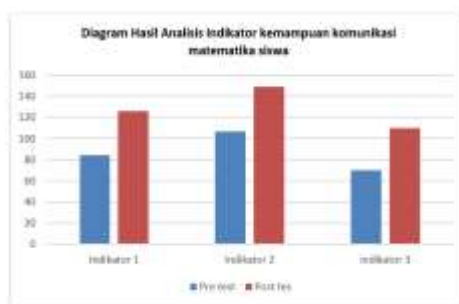


Figure 8

Diagram of Indicator Analysis Results of students' mathematical communication skills

Based on the analysis of the diagram above, it can be seen that the score of students' mathematical communication skills has increased. The first indicator, namely the ability to state the problem situation into pictures and graphs, which originally before using E-LKPD only obtained an overall score of 84 and after using E-LKPD increased to 126, in the second indicator, namely the ability to state the problem situation in the form of a mathematical model, the original score before using E-LKPD only obtained an overall score of 107 and after using E-LKPD increased to 149. Then on the third indicator, namely the ability to explain the solution of ideas or situations from a given image into the mathematical model in the form of mathematical writing which originally before using the LKPD only obtained an overall score of 70, and after using the E-LKPD increased to 110.

Conclusion

The results of this development research in the form of developing E-LKPD with a problem-based learning approach and based on Jambi culture to improve students' mathematical communication skills, it can be concluded that the E-LKPD developed is valid and feasible to use based on improvements according to suggestions and comments, then practicality is obtained from the assessment and responses from teachers and students to the E-LKPD and the results of teachers and students gave positive responses to the E-LKPD developed and according to them this teaching material can make students interested in the learning process, and the effectiveness of E-LKPD is seen from the products developed can improve students' mathematical communication skills, namely the results of the pre-test and post-test. The results obtained in the N-gain test are a score of 0.5 in the moderate category and it can be said that the E-LKPD with a problem-based learning approach based on Jambi culture to improve students' mathematical communication skills is effective.

Researchers also suggest further development research to be able to develop E-LKPD learning media for mathematics using other better applications so that E-LKPD can be more interesting and increase students' interest and enthusiasm for learning.

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