

IMPROVING THE ABILITY OF THE MATHEMATIZATION PROCESS THROUGH THE DEVELOPMENT OF LKPD WITH A REALISTIC APPROACH TO STATISTICAL MATERIAL

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Abstract

This study aims to determine the improvement of the ability of the mathematization process of grade VIII students through the development of LKPD with a realistic approach to statistical material. This type of research is Research and Development (R&D). The subjects in this study were grade VIII students at SMP Negeri 10 Tegal. The development procedure used is the ADDIE development model which is limited to the Development stage, so that modifications to the development model are carried out according to needs. The data collection techniques used were interviews and validation. Interviews are conducted to analyze the needs of learners, the ability of the learners' mathematization process and concepts. Validation is carried out to determine the validity assessment of LKPD that has been developed. The results showed that there was an increase in the ability of the mathematization process through the development of LKPD with a realistic approach to statistical material.

Keywords: Ability of mathematization process, development of LKPD, realistic, statistics.

1 INTRODUCTION

Education is something that cannot be separated from human life. The importance of education is one of the benchmarks of a nation's progress. A developed nation is a nation that has quality human resources. One way to create quality human resources is to need quality education as well. Education is one of the efforts to develop the potential of human resources, especially students [1]. Students can study several fields of education, one of which is mathematics which is a science that is learned from all levels, both from elementary to tertiary levels.

Mathematics is one of the basic sciences that has an important role in the development of science and technology. In addition, human activities in everyday life cannot be separated from the use and application of concepts in mathematics [2]. Mathematics is also one of the subjects studied from elementary to college levels, so the use of mathematics is related to all aspects of everyday life.

The ability of the student mathematization process is an ability that students must have in learning mathematics. Mathematics related to reality is mathematics that must be connected with the daily lives of students and mathematics as a human activity which means that the process of mathematization occurs when students learn mathematics related to everyday life [3].

Learning devices are devices that teachers need to support learning depending on the type and purpose of learning. The preparation of learning tools is the initial stage of the learning process [4]. LKPD is a sheet that provides instructions to learners to complete a task, usually an investigation or problem-solving task. LKPD can help students complete tasks and follow the learning process [5]. Teacher creativity as educators plays an important role in the development of LKPD as a source of learning for students [6].

The curriculum is designed and prepared by considering several important aspects, such as the times, so that the government prepares and establishes policies to enforce the curriculum that has been prepared [7]. The curriculum applied for grade VIII students of SMP Negeri 10 Tegal is the 2013 curriculum. Statistics is one of the materials that is difficult to understand in mathematics lessons in even semesters, because it has quite abstract concepts, especially for students who are learning it for the first time. Statistics is an important subject matter in mathematics education in schools that helps

students understand mathematical concepts related to collecting, analyzing, and interpreting data and statistical materials must be given to junior high school students [8].

An interview that was held on December 30, 2022 with two grade VIII teachers of SMP Negeri 10 Tegal. The results of the interview stated that the learning media used in statistical material is images. The teaching materials used in statistical materials are teaching modules from the Subject Teacher Deliberation (MGMP). However, the use of media and teaching materials in statistical learning has problems in understanding statistical material and the ability of the mathematical process of students is low. This is because teachers only use teaching modules in the learning process, so LKPD is needed to be developed to solve student problems. One of the steps that teachers can take is to apply the right learning model or method so that learning takes place in accordance with the desired learning objectives [9].

The implementation of learning on statistics material shows that some students who do not understand statistical material in analyzing data and students tend to only be able to solve easy problems using the right steps, however, teachers are less effective in using learning tools that are in accordance with statistical material and use the right learning approach when teaching daily statistics problems. As a result, students have difficulty solving problems with the right steps if given difficult questions. The learning process is applied using discussion and lecture methods. This results in students having difficulty in solving statistical problems given by the teacher because they are slow in understanding statistical material. Teaching materials are made to help achieve learning objectives that are tailored to the needs and characteristics of students [10]. So that the use of appropriate teaching materials and appropriate methods is very necessary in learning statistics. The results of the Daily Mathematics Test for the 2021/2022 Academic Year on statistical material show the low ability of the students' mathematization process. The average score shows an illustration of the ability of students in understanding statistical material, where the overall average score of students is still below KKM, which is less than 70.

Based on the background of the above problem, it is necessary to develop mathematics learning tools in the form of LKPD with a realistic approach to statistical material to improve the ability of the mathematization process of grade VIII students at SMP Negeri 10 Tegal which is valid and suitable for use in the learning process.

2 METHODOLOGY

The type of research in this study is Research and Development (R&D). Research and Development is research commonly used to develop a new product, idea or technology and is used to test the effectiveness of a product [11]. The location of this study is SMP Negeri 10 Tegal. The time of data collection carried out in this study is in the 2022/2023 school year. The subjects in this study were grade VIII students of SMP Negeri 10 Tegal. The object of this research is a learning tool in the form of LKPD.

The development procedure in this study uses the ADDIE development model, which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation [12]. However, the development stage of LKPD is limited to the development stage, so the development model must be changed according to needs. There are several stages of development carried out in this study are as follows:

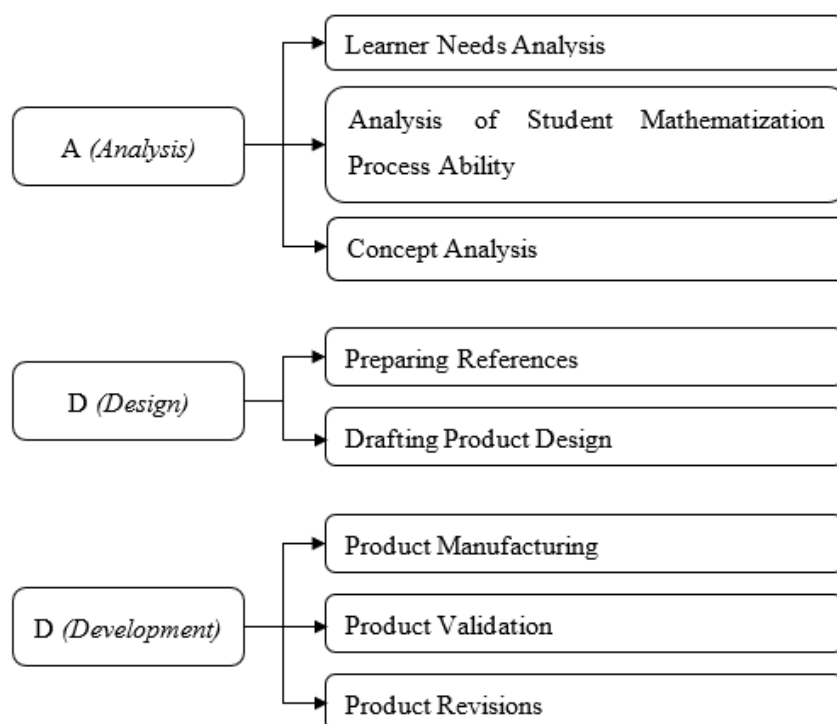


Figure 1. Modified ADDIE development model chart.

Based on figure 1, it is obtained that the stages of research carried out at the analysis stage are information collected to be used as a basis for making products in this study, this information collection is in the form of analysis of student needs, analysis of the ability of the student mathematization process and concept analysis. At the design stage, there are several steps that need to be done, namely: making references and making product designs that will be developed in this study. At the development stage, the product designed in the design design stage is then made into a real product. Some of the stages carried out are product creation, product validation, and revision.

Data collection techniques in this study were interviews and validation questionnaires. The data used came from interviews conducted at the analysis stage, which included analysis of student needs, analysis of students' mathematization process abilities, and concept analysis. The validation questionnaire is used to obtain expert assessment data on the developed LKPD so that they can receive input in the development of the product for the better. Five expert lecturers from mathematics education at Pancasakti University Tegal and two grade VIII mathematics teachers at SMP Negeri 10 Tegal became validators to validate the LKPD that had been developed.

The interview data analysis technique used is that after carrying out the interview stage, the interview results obtained are then analyzed with steps namely data reduction, data presentation, and conclusion drawing [13]. The validity data analysis technique used to evaluate the validity of LKPD is the Likert scale. The Likert scale is a scale used to measure the attitudes, opinions, and perceptions of a person or group of people about social phenomena [14].

In evaluating the validity of LKPD, the scoring used is as follows:

Table 1. Validation scoring.

Pilihan Jawaban	Kategori
Sangat Baik	4
Baik	3
Kurang Baik	2
Tidak Baik	1

The average score of each validator can be calculated using a predefined formula [15]. The formula used is as follows:

$$\nabla = \frac{\sum_{i=1}^n x_i}{n}$$

Information:

∇ = Average total validation

x_i = Value of the I-th Assessment Instrument

n = The abundance of research instruments

Then, the formula used to calculate the average value of all validators is as follows [15]:

$$\bar{X} = \frac{\sum_{i=1}^n V_i}{n}$$

Information:

$\bar{X}$ = Total value of all average validators

V_i = I-th validator validation average score

n = Number of validators

The results obtained are further interpreted by the following criteria [15]:

Table 2. *Validation categorization.*

Score interval	Category
$0 < \bar{x} \leq 1,75$	Very less valid
$1,75 < \bar{x} \leq 2,50$	Less valid
$2,50 < \bar{x} \leq 3,25$	Valid
$3,25 < \bar{x} \leq 4,00$	Highly valid

3 RESULTS

This research was conducted to improve the ability of the student mathematization process through the development of LKPD with a realistic approach to statistical material. The development procedure carried out in accordance with the ADDIE development model is limited to the development stage, due to limited time to carry out the implementation and evaluation stages in the learning process. The result of this study is to produce a valid LKPD and can improve the ability of the student mathematization process.

3.1 Analysis

The Analysis stage is the first stage carried out and becomes the basis for the development of LKPD which will be realized in this study, where in this stage the product design is developed according to the needs of students. In the analysis stage consists of several stages of analysis which include:

3.1.1 Learner Needs Analysis

Analysis of student needs is carried out to determine the needs of students related to learning media used in mathematics learning, especially in statistical materials. From the results of observations and interviews that have been conducted previously, it can be seen that there has been no use of learning media in the form of LKPD which is used in statistical material during the learning process for grade VIII students at SMP Negeri 10 Tegal, so in this study it is necessary to develop LKPD as a

support in the learning process that will facilitate students in understanding statistical material and can improve the ability of the participant mathematization process educate.

3.1.2 Analysis of Mathematization Process Ability

Analysis of the ability of the mathematical process is used to determine the ability of students to apply the mathematical process in solving mathematical problems. Based on the results of observations and interviews that have been conducted previously, it was found that students have difficulty in solving problems in statistical material and the ability of the student mathematization process is low. The low ability of the mathematical process of these students can be seen from the results of the Mathematics Daily Test score for the 2021/2022 Academic Year in aspects of statistical material that are still below the KKM, which is less than 70. Difficulties experienced by students because teachers use media and learning approaches that are less effective. As a result, the learning process becomes less interesting and students become slow in understanding statistical material.

3.1.3 Concept Analysis

Concept analysis is based on statistical material in accordance with the basic competencies set out in the 2013 curriculum. Then, to make the material to be presented more organized, it is arranged in the form of a concept map.

3.2 Design

The design stage is the second stage which includes material identification, product design, and determination of the LKPD format to be produced. In the process of material identification, analysis is carried out to determine competency standards, core competencies, and learning materials to be used in the development of LKPD. Furthermore, the product design stage establishes the specifications of the product to be made so that it is in accordance with the learning objectives to be achieved.



Figure 2. LKPD cover design with a realistic approach to statistical material.

3.3 Development

The third stage is the Development stage which is the final stage in this research, where in this stage the resulting product design will be realized. The stages carried out in the development stage are as follows:

3.3.1 Product Manufacturing

The product manufacturing stage is the first stage, where the pre-designed product is realized into a real product. In this study, the product developed is LKPD with a realistic approach to statistical material to improve the ability of the mathematization process of grade VIII students.

3.3.2 Product Validation

The product validation stage is the second stage after the product is finished and then validated by expert lecturers and junior high school teachers as practitioners. This LKPD validator consists of five mathematics education lecturers at Pancasakti Tegal University and two grade VIII mathematics teachers at SMP Negeri 10 Tegal. The results of the validation that have been carried out are then averaged and the results are compared with the categories that have been set. The purpose is to test whether the LKPD that has been made is valid and suitable for use in learning, as well as to get input, suggestions, and evaluations of the LKPD.

The following is a table of LKPD assessment analysis results from each validator, as follows:

Table 3. *Results of LKPD assessment analysis.*

Validator Name	Number of scores	Average score
1st Validator	140	4,0
2nd Validator	140	4,0
3rd Validator	140	4,0
4th Validator	140	4,0
5th Validator	140	4,0
6th Validator	140	4,0
7th Validator	140	4,0
Average of All Validators		4,0
Category	Highly Valid	

The calculation results in table 4 show that starting from the 1st to the 7th validator, they provide similar results in the assessment on all aspects in the LKPD validation sheet. The data shows that the 1st validator gets a total score of 140 with an average score of 4.0. Similarly, the 2nd validator, 3rd validator, 4th validator, 5th validator, 6th validator, and 7th validator also obtained the same number of scores, namely 140, with an average score of 4.0. It is known as a result of obtaining a uniform average from each validator, so that the average score of the seven validators is 4.0, which shows that this LKPD is very valid and worthy of use in learning.

3.3.3 Product Revisions

The product revision stage, based on the validation results that have been given by each validator, there are suggestions for improvements to produce a better LKPD. The advice given by each validator is to fix the bar chart image whose ordinate axis is not yet clear lines and units; add a visualization image of the problem; adding captions of new terms or information that students rarely encounter in everyday problems and moral messages from the problems presented; add questions to make them more varied; amend the sample questions and practice questions presented at meeting 1 to match their indicators and learning objectives; add sample questions and practice questions that lead

to the ability to draw conclusions, make decisions, and make predictions; provide direction on the steps of the mathematization process on the learner's answer sheet; make practice question number 6 at meeting 2 more realistic; add a bibliography; make some examples of questions presented more natural such as the number of students should be around 35 people per class; create data on the problem with varied multiples so that the graph looks more natural; add light colors to the LKPD cover to make it more attractive; Change the background color of the material so that it is synchronized with the color of the writing. All suggestions given by validators are in line with the theoretical studies in this study, so that the LKPD developed is very valid and worthy of use in learning.

3.3.4 Product Trials

The final stage after producing the final LKPD is to conduct a limited trial of students in one class, namely taking class VIII.A with a total of 30 students held in one meeting. The trial was divided into 3 groups, where 10 students worked on LKPD at meeting 1, 10 students worked on LKPD at meeting 2, and 10 students worked on LKPD at meeting 3. The results of the LKPD trial that have been carried out by students show that at meeting 1 there were 90% of students who were able to solve problems according to the stages of the mathematization process. And 10% of students have not been able to solve problems according to the stages of the mathematization process. While meeting 2 and meeting 3 showed that 100% of students were able to solve problems according to the stages of the mathematization process. This can be interpreted that there is an increase in the ability of the mathematization process of grade VIII students through the development of LKPD with a realistic approach to statistical material.

4 CONCLUSIONS

Based on the results of the research that has been described, it can be concluded that this study aims to determine the improvement of the ability of the mathematization process of grade VIII students through the development of LKPD using a realistic approach to statistical material. The ADDIE development model used for LKPD development is limited only to the development stage, so modifications are made according to needs. The results of LKPD development seen from the level of validity are categorized as very valid and suitable for use in learning. This is seen from the average final score of LKPD validation results by all validators. The average result of LKPD validation from the 1st validator to the 7th validator is 4.0. And for the average LKPD validation result from the seven validators is 4.0 so as to produce a category of LKPD that is very valid and worthy of use in learning. LKPD seen from the results of limited trials conducted showed an increase in the ability of the mathematization process of grade VIII students with percentage results, namely at meeting 1 there were 90% of students who were able to solve problems according to the stages of the mathematization process, at meeting 2 and meeting 3 showed that 100% of students were able to solve problems in accordance with the stages of the mathematization process.

This research only reached the development stage due to limited research time. Thus, it is hoped that other researchers can continue this research to reach the implementation and evaluation stage in learning to become better research.

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