

# EFFORTS TO IMPROVE THE ABILITY TO UNDERSTAND MATHEMATICAL CONCEPTS OF GRADE VIII JUNIOR HIGH SCHOOL STUDENTS THROUGH THE DEVELOPMENT OF LKPD BASED ON A CONTEXTUAL APPROACH TO OPPORTUNITY MATERIAL

Windy Ayu Anjani<sup>1\*</sup>, Dian Nataria Oktaviani<sup>2</sup>, Ahmadi<sup>3</sup>

<sup>123</sup>Department of Mathematics Education, Pancasakti Tegal University, Tegal, Indonesia

\*Corresponding author: windyayuanjani@gmail.com

## Abstract

This study aims to determine valid forms of LKPD and find out the results of developing worksheets for students with opportunity material in an effort to improve the ability to understand mathematical concepts of grade VIII students who meet valid criteria. The development model used in this study is ADDIE which includes the stages of analysis, design, development, implementation and evaluation. But this research is only limited to the development stage. The instrument used to measure the validity of LKPD developed is a validity questionnaire by expert lecturers and mathematics teachers. The validity of LKPD is assessed from the assessment of experts with a maximum score of 4 for each statement. The results of the LKPD assessment from four lecturers and two teachers amounted to 3.83 so that it can be interpreted that the LKPD developed has a very valid category.

Keywords: LKPD development, opportunities, ability to understand mathematical concepts, contextual approach

## 1 INTRODUCTION

Mathematics is a very important and useful subject to learn, by learning mathematics can help increase potential, help solve everyday problems and help improve the ability to understand mathematical concepts [1]. One of the goals to be achieved in learning mathematics is the ability to understand mathematical concepts. This is in line with Permendiknas Number 22 of 2006 formulating the objectives of learning mathematics in schools, namely 1) understanding mathematical concepts, 2) using reasoning, 3) solving problems, 4) communicating ideas, 5) having an attitude of appreciating the usefulness of mathematics in life [2].

The ability to understand mathematical concepts is one of the key aspects of mathematics learning goals and objectives [3]. This is because the understanding of mathematical concepts is the root or basis for mastery of other higher mathematical concepts or as well as supporting the ability of connections between these concepts, so if the initial understanding base is not strong then it will be difficult to understand the next concepts [4]. Therefore, understanding mathematical concepts is very fundamental in learning mathematics.

Based on the results of an interview conducted on December 30, 2022, to grade VIII teachers of SMP Negeri 10 Tegal, information was obtained that learning does not pay attention to the ability to understand mathematical concepts, learning only focuses on teachers. Teachers are more dominant in explaining that at the time of learning, students are limited to only listening and taking notes. If given a problem, some students still find it difficult to propose the right solving steps, then when given questions with different types, they also find it difficult to find the solution steps, this is because students' understanding of mathematical concepts is still low.

The low ability to understand mathematical concepts of students can be seen from the results of the Mathematics Daily Test scores for the 2021/2022 Academic Year on the material aspect of opportunities. The average score shows an illustration of the ability of students in mastering opportunity material, where the overall average score is still below KKM which is 70. The low ability of these students can also be seen from the data of students based on their grades, where 84.09% of students still have scores below KKM. This can be seen in Table 1.

**Table1.** Average Daily Test Scores of Students in 2022 SMP Negeri 10 Tegal

DAILY TEST ODDS	MATH OF	GRADE POINT AVERAGE							OVERALL AVERAGE SCORE
		VIIA	VIIIB	VIIIC	VIIID	VIIIE	VIIIF	VIIIG	
2022		65,7	55,6	54,8	33,0	39,5	30,93	49,16	46,94

Teachers' efforts in creating pleasant learning conditions cannot be separated from the supporting components of learning, including learning resources. Learning resources are closely related to teaching materials. From the interviews, it is known that the teaching materials used are only in the form of teaching modules from the Subject Teacher Deliberation (MGMP). However, there are shortcomings in the teaching model, including the content is incomplete, still monotonous and less interesting which causes it not to focus on the process of increasing the ability to understand mathematical concepts of students. The low ability to understand mathematical concepts can also be seen from the results of interviews, when students find opportunities in the form of story problems, students cannot do it and it is difficult to understand what is meant by the problem. To overcome this, of course, teaching materials are needed that can facilitate the ability to understand students' mathematical concepts on opportunity material.

The use of teaching materials at SMP Negeri 10 Tegal is not optimal because it has not utilized other alternative teaching materials such as *powerpoints*, learning videos or student worksheets (LKPD). LKPD is a printed teaching material in the form of sheets containing material, summaries, exercises and instructions that must be done by students [5]. LKPD presents a sequence of steps that are useful for understanding the content of the material in order and achieving the intended learning objectives and increasing self-understanding of the learning material (previous research sources). Student worksheets are expected to be an alternative to be able to improve the ability to understand mathematical concepts.

In learning, it should provide opportunities for students to construct their knowledge so that students more easily understand the concepts of the material taught [6], so an appropriate learning approach is needed to be linked in LKPD. One learning approach that can be implemented is a contextual approach. The contextual approach is defined as a learning concept that helps teachers associate the material taught with real-world situations students make connections between the knowledge they have and their application in life [7].

The goal to be achieved is to produce products in the form of LKPD with a contextual approach that can be used in opportunity material so that it can be used in the learning process to improve understanding of mathematical concepts. LKPD with a contextual approach intended in this study is LKPD which is developed oriented to the components of the contextual approach and the problems presented are related to real life. The context of the problem raised must be in accordance with the concept of the material being studied. In the development of LKPD with this contextual approach, it is hoped that students will be more interested and motivated to learn mathematics and guide students in constructing their knowledge. Therefore, this study aims to produce and test the feasibility of LKPD with a contextual approach to opportunity material in improving the ability to understand mathematical concepts.

## 2 METHODOLOGY

The research carried out is the development of LKPD based on a contextual approach to opportunity material, thus the method used in research is the research and development method (*Research and Development / R & D*). According to Sugiyono [8] research and development (*Research and Development / R&D*) methods are research methods used to produce a particular product and test the effectiveness of the product. In this study, the product developed was a student worksheet based on a contextual approach on opportunity material for grade VIII students in the even semester.

The location to conduct this research is SMP Negeri 10 Tegal located on Jalan Kartini No. 58, East Tegal District, Tegal City. This research plan is carried out in the even semester of the 2022/2023 academic year by adjusting the hours of mathematics lessons in class VIII itself. The subjects of this study were grade VIII students at SMP Negeri 10 Tegal. Self-developed research on the ability to understand mathematical concepts of students. Researchers take the object of research in the form of learning tools, namely RPP and LKPD on opportunity material.

The LKPD development procedure on class VIII opportunity material of SMP Negeri 10 Tegal uses the ADDIE development model which includes *Analyze*, *Design*, *Development*, *Implementation* and *Evaluation* proposed by Cahyadi [9]. In this research, the development stage is limited to the development stage, this is because the implementation of learning teaching materials is still a trial activity, namely development is arranged to obtain a valid LKPD as needed. The stages that will be carried out in this research are:

#### Stage 1. *Analyze*

The analysis stage is a pre-planning stage, carried out by analyzing needs and problems in the form of relevant materials, teaching materials, and learning conditions [10]. The information needed in this analysis stage is in the form of analysis of student needs, analysis of contextual approaches, analysis of the ability to understand mathematical concepts and analysis of material concepts.

#### Stage 2. *Design*

At the design stage, formulating the necessary elements in LKPD such as indicators and learning objectives as well as drafting LKPD based on a contextual approach to opportunity material, which is carried out, namely preparing references for products and compiling product designs.

#### Stage 3. *Development*

It is the stage of implementing what has been made in the design stage to become a product. The end result of this stage is a product that will be tested. Furthermore, validation will be carried out by experts in their fields, namely four lecturers and two junior high school teachers. This expert validation aims to assess whether LKPD meets the valid criteria.

The source of data in this study is daily test score data on opportunity material obtained from grade VIII teachers of SMP Negeri 10 Tegal and interviews conducted with grade VIII teachers of SMP Negeri 10 Tegal. The form of data in this study is a description of the stages of LKPD development of opportunity material. The results of data collection are in the form of descriptions obtained from interviews. The instruments used include interview sheets, and expert validation questionnaires.

In this study, the interview results that have been obtained from two resource persons, then analyzed with the following steps [11] :

1. **Data Reduction**  
That is the process of selecting, centralizing or focusing the data obtained from the interview. The results of the interview are identified and linked to the focus and problem of the study.
2. **Categories**  
That is an effort to sort the data into parts that have similarities to the research problem.
3. **Synthesis**  
That is the process of looking for relationships and relationships between one category and another.
4. **Conclusion Drawing**  
Conclusions are drawn based on the analysis of data that has been collected. Based on the analysis of the data, interpretation is then held to obtain a conclusion.

The validity analysis technique used in this study to determine the validity of LKPD through expert validation questionnaires is based on a 4-point *likert* scale, with the following scoring of kebalidam analysis:

Table 2. Validation Scoring

Answer Selection	Skor
Very Relevant	4
Relevant	3
Less Relevant	2
Irrelevant	1

Source : Widoyoko (2013)[12]

The results of these calculations can be interpreted using the following categories:

Tabel 3. Validation Categorization

Score Interval	Category
$0 < \bar{x} \leq 1,75$	No 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

Source : Widoyoko (2013)

### 3 RESULTS

The results of LKPD development research carried out with the ADDIE stage which is limited to the *Development* stage are as follows:

#### 3.1 Analyze

At the analysis stage, an analysis of student needs is carried out, analysis of the ability to understand mathematical concepts, analysis of contextual approaches, and concept analysis. Some of the things obtained from the analysis stage are as follows:

##### 3.1.1 Analysis of student needs

Analysis of student needs, aims to find out the needs of students and find out the basic problems faced in learning related to learning media used in mathematics learning at SMP Negeri 10 Tegal grade VIII. From the results of interviews that have been conducted previously that the learning media used in the opportunity material in grade VIII SMP Negeri 10 Tegal are teaching aids, as well as teaching materials on the opportunity material used, namely teaching modules from the Subject Teacher Deliberation (MGMP).

##### 3.1.2 Analysis of Ability Understand Mathematical Concepts

Analysis of the Ability to Understand Mathematical Concepts, carried out to determine the ability to understand mathematical concepts of students. Based on the results of the interview, it was found that when students were given story questions, some were still difficult to understand the context of the questions, then when given questions with different types, students were still difficult to determine the completion steps, information was also obtained that the average daily test scores of students in mastering opportunity material that showed scores were still below KKM. So that the preparation of LKPD is adjusted to the abilities of students and will train students' concept understanding abilities.

### **3.1.3 Contextual Approach Analysis**

Contextual Approach Analysis, conducted to find the relationship between the subject matter and the experience or environment of students. With a contextual approach, teachers are expected to guide students to understand what to learn opportunity material for so that students become more active in learning and can solve daily problems related to opportunity material.

### **3.1.4 Concept Analysis**

Concept Analysis aims to identify the main material, namely opportunities, as well as material details, namely empirical opportunities and theoretical opportunities, which are then systematically rearranged to find out what components will be taught in LKPD.

## **3.2 Design (Desain)**

At the design stage, it is carried out by formulating the necessary elements in the LKPD such as indicators and learning objectives as well as drafting the LKPD material, the opportunities to be presented and the design of the LKPD framework to be made.

### **3.2.1 The initial section**

Consists of the front cover, title of the LKPD, authors and editors, foreword, instructions for using the LKPD and what is in this LKPD?, core competencies (IC), basic competencies (KD), and indicators of competency achievement (GPA), concept map, table of contents and introduction.

### **3.2.2 The content section**

Consists of contextual problems, material concepts, example questions, let's practice 1, let's practice 2 (mathematical concept understanding activities), practice questions and competency tests.

### **3.2.3 The cover section**

Consists of a bibliography and back cover

## **3.3 Development (Pengembangan)**

The final stage is development, at this stage the design will be realized. The development steps carried out are as follows

### **3.3.1 Form of LKPD**

The form of LKPD is the final product of this research, namely student worksheets based on a contextual approach which contains opportunity material and details, namely empirical opportunities and theoretical opportunities. This student worksheet is adjusted to indicators of the ability to understand mathematical concepts according to Klipatrick [13], namely restating concepts, presenting concepts in various forms of mathematical representation, applying concepts algorithmically, classifying objects based on whether or not the requirements that make up the concept are met, providing examples and not examples of concepts.

The material developed in this student worksheet is presented based on the components of a contextual approach, namely making meaningful connections, doing meaningful work, doing self-regulated learning, working together, thinking critically and creatively, helping individuals to grow and develop, achieving high standards, using authentic assessment [14].

The results of the development and improvement of validator improvement suggestions are as follows:

Table 4. LKPD Display

LKPD display Initial part		
LKPD cover	Title LKPD	Writers and editors
Foreword	Clues and what's in LKPD?	KI, KD, and IPK
Concept Map	Contents	Introduction

LKPD Display Content section

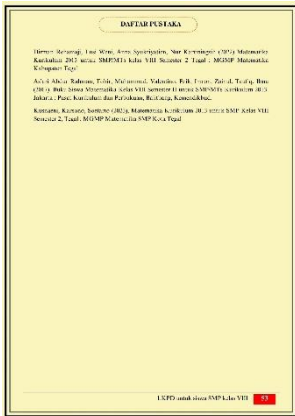

Contextual Issues
Material Concept
Sample questions

Peristiwa (A)	Jumlah Peristiwa (n(A))	Jumlah Peristiwa (n(S))
1	1	10
2	2	10
3	3	10
4	4	10
5	5	10
6	6	10
7	7	10
8	8	10
9	9	10
10	10	10

Peristiwa (A)	Jumlah Peristiwa (n(A))	Jumlah Peristiwa (n(S))
1	1	10
2	2	10
3	3	10
4	4	10
5	5	10
6	6	10
7	7	10
8	8	10
9	9	10
10	10	10

Let's practice 1
Concept understanding activities
Practice questions

Competency test

LKPD Display Cover Section	
	
Bibliography	Back Cover

### 3.3.2 Product Validation

Research efforts to improve the ability to understand mathematical concepts of grade VIII junior high school students through the development of LKPD based on a contextualized approach to opportunity material using ADDIE development methods, *namely Analyze, Design, Development, Implementation and Evalyation* (Evaluation). However, in this study the research stage is limited to the *development* stage so it is recommended that other researchers need to test the practicality and effectiveness of this LKPD in improving student learning outcomes, because this research is only limited to the validity test stage.

At the analysis stage, several things are done, namely the analysis of student needs, analysis of the ability to understand mathematical concepts, contextual approach analysis and concept analysis. The conclusion based on the analysis stage is that the selection of teaching materials in accordance with the presentation of problems related to real life can lead students to construct their knowledge so that they can foster an understanding of mathematical concepts, especially in opportunity material. This condition is in accordance with research conducted by Hamidah, Sri Hastuti Noer and Caswita [15] which states that through contextual approach components and the problems presented are related to real life, students can find and grow their understanding of mathematical concepts.

At the design stage, the activities carried out include material identification, design preparation, and determination of the LKPD format. From the results of the design, researchers chose opportunity material as the subject of LKPD, the preparation of designs that were made as attractive as possible and the structured LKPD format. The conclusion drawn at this stage is what steps are taken so that the LKPD design developed later is in accordance with the 2013 curriculum, especially the opportunity material for junior high school grade VIII. This condition is in accordance with research conducted by Arlina Mandasari [16] which states that the design stages in product preparation include material identification, design preparation and determination of LKPD format.

The final stage, namely the development of activities carried out, is the creation of LKPD, validation, revision. The conclusion obtained is that the LKPD that has been developed is then validated by experts as a reference to see its feasibility and validity and so that it can be seen whether there are deficiencies in the developed LKPD. If the LKPD has been declared valid, it can be interpreted that the LKPD has been developed so as to produce a final product, namely LKPD based on a contextual approach to improve the ability to understand mathematical concepts in student opportunity material.

LKPD validation was carried out by four expert lecturers from Mathematics Education at Pancasakti Tegal University and two mathematics teachers from SMP Negeri 10 Tegal. In providing value, validators have provided suggestions for improvements to the LKPD that has been developed in order to get a better final product. The average acquisition of LKPD validation results from the six validators was 3.83 by producing a category that is very valid, so it can be concluded that LKPD based on a contextual approach in improving the ability to understand mathematical concepts of students has been developed and meets the criteria of being very valid.

Based on the description above, it can be concluded that LKPD based on a contextual approach as an effort to improve the ability to understand mathematical concepts in opportunity material has been developed and meets very valid criteria.



## 4 CONCLUSIONS

Based on the results of research and discussion, the development of LKPD uses the ADDIE development model which is limited to the development stage. The results of LKPD development seen from the aspect of validity are categorized as very valid and suitable for use in learning. This is based on the average final score of LKPD validation results by all validators of 3.83 so as to produce an LKPD category that is very valid and suitable for use in learning.

## ACKNOWLEDGEMENTS

First of all I thank Allah SWT who has given me smoothness in compiling this article, secondly I thank my parents and family who always pray and support me in compiling this article to completion. Then I would like to thank Mrs. Dian Nataria Oktaviani S.Si., M.Pd and Mr. Ahmadi S.Pd., M.Si as my supervisor who always provide direction during the research process to the preparation process, and I would like to thank my comrades in arms who always pray, help and encourage me during the preparation of this article. And thanks to Public Junior High School 10 Tegal for allowing me to conduct research.

## REFERENCES

- [1] Cahyadi, R. A. H. (2019). Development of Addie Model-Based Teaching Materials *Halaqa: Islamic Education Journal*, 3(1), 35–42. <https://doi.org/10.21070/halaqa.v3i1.2124>
- [2] Denpasar, U. M. (2021). *NUSANTARA: Journal of Social Sciences I Made Dharma Atmaja*.8, 2048–2056. <https://doi.org/10.31604/jips.v8i7.2021.2048-2056>
- [3] Johnson, E. B. (2002). *Contextual Teaching & Learning*. Corwin Press.
- [4] Klipatrick, Swafford, & Findell. (2011). *Helping Children Learn Mathematics*. National Academy Press.
- [5] Manullang, M. (n.d.). *Mathematics Learning Management*. 21(2)
- [6] Moleong, & Lexy J. (2014). *Qualitative Research Methods Revised Edition*. PT Remaja Rosdakarya.
- [7] Pasaribu, E. (2017). *Differences in improving students' mathematical comprehension and communication skills through guided discovery learning models*. 70–81.
- [8] CONTEXTUAL LEARNING OF MATHEMATICS LEARNING DIFFICULTIES AND STUDENTS' MATHEMATICAL REASONING ABILITIES Faizal Fanany, K., & Pancasakti Tegal, U. (n.d.). *INDIKTIKA (Jurnal Inovasi Pendidikan Matematika)*. 1(2), 144–153
- [9] *STUDENT WORKSHEET DEVELOPMENT(LKPD)*. (n.d.).
- [10] *Development of Contextual-Based LKPD in Improving Understanding of Mathematical Concepts and Dispositions Hamidah, Sri Hastuti Noer, Caswita*. (n.d.).
- [11] Prastowo, A. (2011). *Creative Guide to Creating Innovative Teaching Materials*. DIVA Press
- [12] Rantumanan. (2015). *Learning Innovation*. Penerbit Ombak.
- [13] Sugiyono. (2015) *Quantitative, Qualitative and R&D Research Methods* Alfabeta.
- [14] Widoyoko. (2012). *Research Instrument Preparation Techniques*. Pustaka Belajar.
- [15] Zulnaldi, H., & Zakaria, E. (2012). The Effect of Using GeoGebra on Conceptual and Procedural Knowledge of High School Mathematics Students. . *Asian Social Scienc*.