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THE DEVELOPMENT OF STUDENT WORKSHEETS (LKPD) BASED ON INDONESIAN REALISTIC MATHEMATICS EDUCATION (PMRI) ON THE MATERIAL OF SURFACE AREA ON CURVED SIDE OF SOLID FOR STUDENTS OF SMP AMAYATUL HUDA 2021/2022 ACADEMIC YEAR

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ABSTRACT

This research is a research on the development of Student Worksheets (LKPD) based on Indonesian Realistic Mathematics Education (PMRI) on the subject of curved side of solid. This study aims to 1) describe the product quality of the Student Worksheet (LKPD) based on Indonesian Realistic Mathematics Education (PMRI) on the subject of curved side of solid, 2) describe the results of the development of Student Worksheets (LKPD) based on Indonesian Realistic Mathematics Education (PMRI) on the subject of curved side of solid. In this study, researchers used research and development procedures according to Sugiyono which have been modified. The subjects of this study were students of class IX SMP Amayatul Huda Kec. Medan, Deli Kel. Labuhan Deli. The object of this research was the Student Worksheet (LKPD) which was developed by the researcher. The data collection technique used was the result of validation and the results of interviews related to student responses regarding the use of the Student Worksheet (LKPD) product. The development procedure in this research included: (1) Potential and problems; (2) Data collection; (3) Product design; (4) Design validation; (5) Design revision; (6) Product trial. The results of the product validation of the Student Worksheet (LKPD) developed by the researcher were 3.9 and 4.2 and included in the good category. The Student Worksheet (LKPD) developed by the researcher received a positive response from the class IX students of Amayatul Huda Middle School.

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1. INTRODUCTION

Mathematics is a science that is widely used in everyday life. The importance of using mathematics in everyday life makes mathematics a science that must be mastered by everyone. Therefore, mathematics is one of the compulsory subjects taught in schools. Although mathematics has many benefits for everyday life and is a compulsory subject taught in schools, mathematics is actually one of the subjects that some students dislike and even fear, so that some students tend to avoid the lesson. The level of difficulty in solving math problems is one of the reasons students avoid math lessons and even make mathematics a deadly subject.

For a mathematics teacher, making students love mathematics is a fairly difficult job. Therefore, mathematics teachers are expected to be able to create a pleasant learning atmosphere therefore students do not avoid and fear mathematics lessons and can like mathematics lessons which make students easier to understand the mathematical material taught by the teacher. By using the right teaching materials, it is hoped that it can improve students' learning abilities. There are many teaching materials that can be used in a learning process. One of the teaching materials that can be designed by teachers as a tool for students to understand learning materials is the Student Worksheet (LKPD). The Ministry of Education, Culture, Research and Technology (2008: 13) stated that LKPD (student worksheets) are sheets containing tasks that must be done by students, usually in the form of instructions, steps to complete the task by referring to the Basic Competence (KD) to be achieved. By using LKPD in the mathematics learning process, it is hoped that it can help students build their own knowledge independently or in groups by utilizing students' knowledge regarding the learning materials that have been studied.

Andi Prastow, (2011: 204) stated that LKPD can also be defined as printed teaching materials in the form of sheets of paper containing material, summaries, and instructions for carrying out tasks that must be done by students, which refers to the achieved basic competencies. Akbar (2013: 45) stated that the learning approach is as follows: perspective to teach students through a certain center of attention. One of the learning approaches that can be used by mathematics teachers is the Indonesian Realistic Mathematics Education (PMRI) approach. PMRI is a mathematical approach adapted from Realistic Mathematics Education (RME) which is applied in the Netherlands and has been adapted to the conditions of culture, geography, and the life of the Indonesian people. PMRI is an approach that uses realistic student situations that can be imagined by students because they are related to everyday life.

PMRI is an adaptation of Realistic Mathematics Education (RME) which is mathematics learning where human and mathematical activities must be connected significantly to the context of students' daily lives as a source of development through the mathematization process both horizontally and vertically. (Zulkardi in Zabeta, et al., 2015: 100).

Abdussakir (2010: 2) stated that one of the lessons that must be mastered by students is geometry. Geometry is a branch of mathematics that occupies a special position in the curriculum because of the many concepts contained in applications in everyday life. One of the discussions in geometry is the curved side of solid. Therefore, students must know the formulas used to determine the surface area and volume of curved side of solid.

For this reason, students must use their reasoning first to identify what problems are contained in the problem and determine the right formula to solve the problem. But not all students can quickly identify the problems contained in the questions, because some students who have poor cognitive abilities will have difficulty identifying and solving problems contained in the questions. Therefore, teachers are needed to design teaching materials such as Student Worksheets (LKPD) which are equipped with certain learning approaches such as Indonesian Realistic Mathematics Education (PMRI) to help students who have difficulty solving problems related to curved side of solid.

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2. METHODOLOGY

The method used in this research is the research and development method or (R&D). According to Gay (1990), research and development is an effort or activity to develop an effective product for schools, and not to test theory . Meanwhile, according to Sugiyono (2017: 297) Research and Development is research that is used to produce certain products, and test the effectiveness of these products.

The subjects in this study were students of class IX Amayatul Huda Middle School in the academic year 2021/2022 and the object of this research was Student Worksheets (LKPD) based on Indonesian Realistic Mathematics Education (PMRI) on the subject of Surface Area of Curved Side of Solid. The development used was the method and development according to Sugiyono (2017: 298) who is stating that the steps in Research and Development (R & D) research consist of 10 steps, such as: 1) Potential and problems; 2) Data collection; 3) Product design; 4) Design validation; 5) Design revision; 6) Product trial; 7) Product Revision; 8) Trial of use; 9) Product Revision; 10) Mass production.

Data collection techniques used in this study were in the form of questionnaires and interviews. The research instrument used in this study was a product validation questionnaire in the form of Student Worksheets (LKPD) and interview guidelines. Data analysis in this research used quantitative and qualitative analysis.

3. RESULTS AND DISCUSSION

The results of this study were carried out using the Sugiyono (2017: 298) development procedure:

Potential and Problems

Before conducting research, researchers first determined the potential and problems which would then be analyzed for needs. To find out the potential and existing problems, the researchers conducted interviews with the mathematics teacher at Amayatul Huda Middle School. The interviews conducted were unstructured interviews about the use of teaching materials and the application of the Indonesian Realistic Mathematics Education (PMRI) approach in the mathematics learning process. Based on the results of the interview, it was found that the PMRI approach was occasionally applied in the mathematics learning process. The implementation of realistic mathematics education in the mathematics learning process was a potential. However, there were also problems such as the lack of use of the PMRI approach in a mathematics learning process. The PRMI approach was only applied to some story problems. In addition, the PMRI approach has never been used formally in a learning device such as lesson plans, teaching materials or Student Worksheets (LKPD).

Information Gathering

After knowing the potential and existing problems, the researchers then collected information through interviews with mathematics subject teachers. A lot of information obtained by researchers was used to plan products that were expected to overcome the problem of the lack of application of a realistic mathematical approach to the learning process. For this reason, researchers used a product in the form of Student Worksheets (LKPD). After determining the product to be developed, the researcher then made the LKPD product design using the PMRI approach.

Product Design

After collecting information, the next step was to compile and develop teaching materials for Student Worksheets (LKPD) based on Indonesian Realistic Mathematics Education (PMRI). Reference sources in developing teaching materials for Student Worksheets (LKPD) were obtained from sources that refer to the materials used in Competency Standards, Basic Competencies, Competency Achievement Indicators, learning objectives, activities in LKPD with the PMRI approach.

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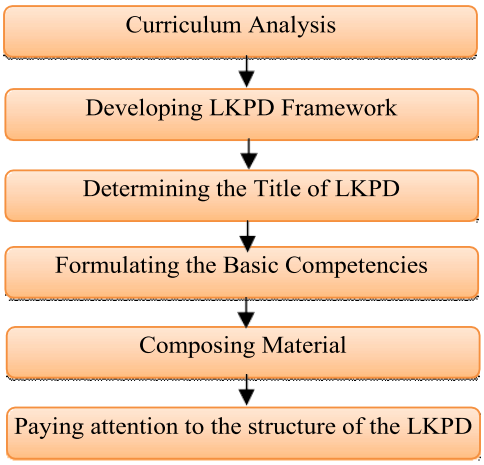

Design Validation

At this stage, what has been designed was then evaluated by competent experts in their fields. The experts are validators who are competent to assess the Student Worksheets (KLPD) and provide input and criticism in order to improve the Student Worksheets (LKPD) that have been prepared. The validators in this study were two lecturers from Universitas Muhammadiyah Sumatera Utara (UMSU). The following were the results of the validation carried out:

Table 1. Lecture Validation Sheet I

No	Research Aspects	Score					Comments and Suggestions
		1	2	3	4	5	
A	LKPD Format						
1	LKPD contains elements, titles, study instructions, basic competencies or subject matter, supporting information, tasks or work steps, and assessments			√			
2	LKPD instructions are simple therefore it is easy to understand				√		
3	Interesting LKPD appearance			√			
B	LKPD Content						
4	Tasks contained in the LKPD suit the achievement indicators				√		
5	The depth of learning material of curved side of solid in LKPD				√		
6	The suitability of tasks in LKPD with the principles of Realistic Mathematics Education (PMR) which includes: (1) guided rediscovery and progressive mathematization (2) didactical phenomenology, and (3) developing their own models			√			
7	The suitability of tasks in LKPD with PMR characteristics which include: (1) the using of context, (2) the using of models for progressive mathematization, (3) the use of students' construction results, (4) interactivity, and (5) linkages			√			
8	Realistic problems contained in LKPD is meaningful for students			√			
C	Language						
9	Using the language that suit the Enhanced Spelling of the Indonesian Language				√		
10	The sentences used are easy to understand				√		
11	Sentences do not cause multiple interpretations or misunderstandings				√		

Mean = Total score/total item

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Table 2 : Lecture Validation Sheet II

No	Research Aspect	Score					Comments and Suggestions
		1	2	3	4	5	
A	LKPD Format						
1	LKPD contains elements, titles, study instructions, basic competencies or subject matter, supporting information, tasks or work steps, and assessments			√			
2	LKPD instructions are simple therefore it is easy to understand					√	
3	Interesting LKPD appearance			√			
B	LKPD Content						
4	Tasks contained in the LKPD suit the achievement indicators					√	
5	The depth of learning material of curved side of solid in LKPD				√		
6	The suitability of tasks in LKPD with the principles of Realistic Mathematics Education (PMR) which includes: (1) guided rediscovery and progressive mathematization (2) didactical phenomenology, and (3) developing their own models			√			
7	The suitability of tasks in LKPD with PMR characteristics which include: (1) the using of context, (2) the using of models for progressive mathematization, (3) the use of students' construction results, (4) interactivity, and (5) linkages			√			
8	Realistic problems contained in LKPD is meaningful for students			√			
C	Language						
9	Using the language that suit the Enhanced Spelling of the Indonesian Language				√		
10	The sentences used are easy to understand					√	
11	Sentences do not cause multiple interpretations or misunderstandings				√		

Mean = Total score/total item

$= \frac{42}{11} = 4{,}2$

Based on the results of the validation carried out by the two lecturers, the average results were 3.9 and 4.2. Based on table 3.3, the product of the Student Worksheet (LKPD) using the PMRI approach was included in the "Good" category. This shows that the designed LKPD is feasible to be tested.

Design Revision

After the product was validated by the expert, the advantages and disadvantages of the developed LKPD product would be known. These shortcomings was revised by the researcher. From the validation results, it was known that the LKPD has shortcomings in the appearance of the LKPD, and the questions given were not in accordance with the principles and characteristics of PMRI. In this study, the researchers developed a Student Worksheet (LKPD) using the Indonesian Realistic Mathematics Education (PMRI) approach to the curved side of solid. The development of the LKPD used a product development technique according to Sugiyono which has been modified by the researcher. The following were the results of research on the development of Student Worksheets (LKPD) based on Indonesian Realistic Mathematics Education (PMRI) on curved side of solid:

Kualitas LKPD yang dikembangkan

To determine the quality of the LKPD products that have been developed by researchers, it can be seen from the results of the validation of LKPD products that have been carried out by experts. Based on the results of the validation carried out by two lecturers, it was found that the average feasibility score was 3.9 and 4.2. The score was included in the "Good" category. In addition to the results of the validity of the LKPD product quality experts developed by the researchers, it can also be seen from some of the student responses obtained from the results of

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interviews conducted after students used the LKPD product on the subject of curved side space. The positive responses of students can be seen from the summary of interview transcripts in table 4.3. From the table, it was known that eight out of ten students interviewed felt happy when using the LKPD that had been developed by researchers. This shows that the LKPD developed by researchers was liked by students therefore students like learning mathematics on the material of curved side of solid. In addition, based on table 4.3 that the advantages of the LKPD developed by researchers can make students better understand the shape of the curved side of solid. Students founnd it helpful to have the LKPD. It was because by using the Indonesian Realistic Mathematics Education (PMRI) approach, students could more easily solve problems related to curved side of solid. Based on the validation results from several experts and strengthened by the positive response of students after using the LKPD with the PMRI approach on curved side of solid, the quality of the LKPD is good.

Table 3. Interview Results

No	List of Questions	The Summary of Student's Answers
1	How do you feel when you take part in learning about curved side of solid using the LKPD? Include your reasons	Eight out of twelve students feel happy when using LKPD. Some are happy because the LKPD looks attractive, while the others are happy because they like the material of curved side of solid. There are two students who feel indifferent when using the LKPD developed by the researcher. However, there are three students who feel confused when using LKPD.
2	In your opinion, what are the advantages of LKPD?	Five students mentioned the advantages of the LKPD developed by the researcher was the attractive appearance of the LKPD Ten students stated that the advantages of the LKPD developed by the researchers were the use of language and the delivery of material using everyday language on the LKPD so that it was easier for students to understand it.
3	What do you think is the weakness of the LKPD?	Five students said that the time for LKPD was less. Four students said that the LKPD developed by the researcher did not have any shortcomings One student said that the questions given were less varied
4	What difficulties did you face when working on the LKPD?	Five students had difficulty in determining the formula to be used.
5	What benefits do you get by using the LKPD?	Eleven students said that the benefits they got after using the LKPD that had been developed by the researcher was that it made them better understand the material for curved side of solid.

The Results of Student Worksheet Development

Based on the results of the interviews in table 4.3, it was known that the feelings experienced by students when participating in learning using LKPD were happy and confused. The confusion experienced by some students was because according to them, the questions given were quite difficult to solve. Even though they were a little confused, they also felt happy when using the LKPD. There are a number of students who feel happy when using the LKPD developed by researchers because by using the LKPD, students can better understand the material for curved side of solid. In addition, students are also happy because some of the advantages possessed by LKPD have been developed by researchers. Some of the advantages of LKPD according to students are the use of interesting pictures and the use of language and the questions contained

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in the LKPD are explained clearly and related to everyday life so that students can imagine the questions that are in the LKPD which make the students can finish it more easily.

However, the LKPD developed by researchers has shortcomings. Based on the results of the interviews, it was found that there were five students who said that the time given was not enough to answer all the questions in the LKPD, four students stated that the LKPD developed by the researcher had no shortcomings, and one student said that the questions given are less varied.

Although some students have difficulty in solving the questions given in the LKPD developed by researchers, students also get benefit from using the LKPD. Based on the results of the interviews, it was found that students were greatly helped in understanding the material for curved side of solid. Prior knowledge of solid material tends to only memorize formulas, but now they can understand better by completing the worksheets that have been developed by researchers.

4. CONCLUSION

The Quality of develoved student sorksheets (LKPD) developed can be seen from the results of validation of LKPD products that have been carried out by experts. Based on the results of the validation carried out by two lecturers, it was found that the average feasibility score was 3.9 and 4.2. The score was included in the "Good" category. In addition to the results of the validity of the LKPD product quality experts developed by the researchers, it can also be seen from some of the student responses obtained from the results of interviews conducted after students used the LKPD product on the subject of curved side of solid. Based on the results of interviews, it is known that the feelings experienced by students when participating in learning using LKPD are happy and confused. The confusion experienced by some students was because the questions given were quite difficult to solve.

In addition, students are also happy because of the advantages provided in the LKPD. Some of the advantages, according to students, are the use of interesting pictures and the use of language and the questions contained in the LKPD which are explained clearly and related to daily life therefore students can imagine the questions that are in the LKPD and easily finish it.

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