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DEVELOPMENT OF STUDENT WORKSHEETS WITH A REALISTIC MATHEMATICS EDUCATION APPROACH SET MATERIAL CLASS VII JUNIOR HIGH SCHOOL

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Abstract:
The Realistic Mathematics Education (RME) approach is one of the approaches that seeks to link mathematical concepts with situations that are relevant and meaningful to students, thus helping them understand these concepts better. Therefore, this approach is important to be integrated into learning, one of which is through the Learner Worksheet. This research aims to develop Learner Worksheets using the Realistic Mathematics Education approach that is valid, practical, and effective. This research is development research with the ADDIE (Analyze, Design, Develop, Implement, Evaluate) development model. The research trial design involved the subject of VII grade students of SMPN 23 Sinjai, Sinjai Regency. Data collection instruments include instrument validation sheets, learner worksheet implementation sheets, learner response questionnaires, teacher response questionnaires, learner activity observation sheets, learning management observation sheets, and learning outcomes tests. The results showed that the Learner Worksheets using the Realistic Mathematics Education approach that had been developed met the criteria of validity, practicality, and effectiveness. This research contributes to providing Realistic Mathematics Education-based Student Worksheets that are valid, practical, and effective so that they can improve the quality of mathematics learning in the classroom.

Keywords: Realistic Mathematics Education, R&D, Student Worksheet

PENGEMBANGAN LEMBAR KERJA PESERTA DIDIK BERBASIS PENDEKATAN PENDIDIKAN MATEMATIKA REALISTIK MATERI HIMPUNAN KELAS VII SMP

Abstrak:
Pendekatan Pendidikan Matematika Realistik (PMR) merupakan salah satu pendekatan yang berupaya mengaitkan konsep-konsep matematika dengan situasi-situasi yang relevan dan bermakna bagi peserta didik, sehingga membantu mereka memahami konsep-konsep tersebut secara lebih baik. Oleh karena itu, pendekatan ini

penting untuk diintegrasikan dalam pembelajaran, salah satunya melalui Lembar Kerja Peserta Didik. Penelitian ini bertujuan untuk mengembangkan Lembar Kerja Peserta Didik menggunakan pendekatan Pendidikan Matematika Realistik yang valid, praktis, dan efektif. Penelitian ini merupakan penelitian pengembangan dengan model pengembangan ADDIE (Analyze, Design, Develop, Implement, Evaluate). Desain uji coba penelitian melibatkan subjek peserta didik kelas VII SMPN 23 Sinjai, Kabupaten Sinjai. Instrumen pengumpulan data meliputi lembar validasi instrumen, lembar keterlaksanaan lembar kerja peserta didik, angket respons peserta didik, angket respons guru, lembar pengamatan aktivitas peserta didik, lembar observasi pengelolaan pembelajaran, dan tes hasil belajar. Hasil penelitian menunjukkan bahwa Lembar Kerja Peserta Didik menggunakan pendekatan Pendidikan Matematika Realistik yang telah dikembangkan memenuhi kriteria kevalidan, kepraktisan, dan keefektifan. Penelitian ini berkontribusi dalam menyediakan Lembar Kerja Peserta Didik berbasis Pendidikan Matematika Realistik yang valid, praktis, dan efektif, sehingga dapat meningkatkan kualitas pembelajaran matematika di kelas.

Kata Kunci: Pendidikan Matematika Realistik, R&D, Lembar Kerja Peserta Didik

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INTRODUCTION

Mathematics learning aims to form the ability to reason in students which is measurable through the ability to think critically, logically, and systematically, and have an objective, honest, disciplined nature in solving a problem both in the field of mathematics and everyday life (Jannati, Isnaini, & Afgani, 2017). However, facts in the field show that the mathematical ability of learners is still very low. Based on the Program for International Student Assessment (PISA) survey in 2022, Indonesia's PISA score in mathematics aspects was 366, a significant decrease compared to the score in 2018 which reached 379 (OECD, 2023; OECD, 2019).

One of the efforts that can be made by educators to improve students' mathematical abilities is to innovate mathematics learning by applying learning concepts and approaches, one of which is the Realistic Mathematics Education approach. Furthermore, several previous researchers have documented the results of their research which states that learning that uses a Realistic Mathematics Education approach has a positive impact on problem-

solving skills (Wulandari, Dantes, & Antara, 2020; Lubis, Ariswoyo, & Syahputra, 2020), understanding of mathematical concepts (Jeheman, Gunur, & Jelatu, 2019), mathematics learning outcomes and student self-confidence (Asdar, Arwadi, & Rismayanti, 2021), mathematical connection ability (Adjie, Putri, & Dewi, 2020), numeracy literacy ability (Maghfiroh, Amin, Ibrahim, & Hartatik, 2021), and interest in learning (Fatimah, Asmara, Mauliya, & Puspaningtyas, 2021).

A characteristic of RME learning is that "realistic" situations are given a prominent position in the learning process. These situations serve as a resource to initiate the development of mathematical learning concepts, tools, and procedures (Heuvel-Panhuizen, Drijvers, Education, Sciences, & Goffree, 2014). There are previous studies that have integrated the Realistic Mathematics Education approach with learning materials such as Student Worksheets (Heriyadi & Prahmana, 2020; Ningrum, Siregar, & Panjaitan, 2023; Sitepu, 2024), e-modules (Benitha & Novaliyosi, 2022; Atikah, Gistituati, Fitria, & Syarifuddin, 2021), digital learning media (Elly Nafsiah & Tiur Malasari Siregar, 2023), e-books (Tania & Siregar, 2022), and teaching aids (Aisyah, 2022). Student Worksheets are one of the teaching materials that aim to convey material to students so that the material can be delivered properly and Student Worksheets as work guidelines to facilitate students in the mathematics learning process (Hikmah, Ilmi, Jannah, Lestari, Zahra, & Imamuddin, 2023). Therefore, the availability of Student Worksheets is very important to improve students' mathematical abilities.

Based on observations of mathematics teachers at SMP Negeri 23 Sinjai, preliminary findings were obtained that teachers were lacking in utilizing the Learner Worksheets. As a result, students can experience difficulties in understanding the subject matter in depth because they do not get sufficient and structured practice through the worksheet. This can also result in a lack of active involvement of students in the learning process, which in turn can have an impact on the achievement of suboptimal learning outcomes. On the other hand, several previous studies have developed learning tools using the RME approach for social arithmetic material (Ningrum, Siregar, & Panjaitan, 2023), a system of three-variable linear equations (Sitepu, 2024; Kinanti, Damris, & Huda, 2021), transformation (Warni, Pangaribuan, & Hutauruk, 2022), limas (Jannati, Isnaini, & Afgani, 2017), Pythagorean theorem (Ariani, Zulkarnain, & Hidayanto, 2023), rows (Zulainy, Rusdi, & Marzal, 2021), cubes and blocks (Heriyadi & Prahmana, 2020), systems of two-variable linear equations

(Rahmawati, Ansori, & Suryaningsih, 2022), however, research on the development of Student Worksheets using the Realistic Mathematics Education approach on set material is still limited. Thus, this research is focused on developing mathematics teaching material in the form of Student Worksheets using the RME approach on set material for Grade VII Junior High School students to facilitate students' mathematics learning experience.

METHODS

This research is a research and development (R & D) using the ADDIE development model (Analyze, Design, Develop, Implement, Evaluate. The research trial design involved subjects of grade VII students of SMPN 23 Sinjai, Sinjai Regency. Data collection instruments include instrument validation sheets, student worksheet implementation sheets, student response questionnaires, teacher response questionnaires, student activity observation sheets, learning management observation sheets, and learning outcome tests.

In this study, validity analysis, practicality analysis, and effectiveness analysis are the three types of data analysis used. The validity criteria (Arsyad, 2016) used can be seen in table 1.

Table 1. Validity Criteria

Interval	Category
$3{,}5 \leq M \leq 4$	Very Valid
$2{,}5 \leq M \leq 3{,}5$	Valid
$1{,}5 \leq M \leq 2{,}5$	Simply
$M \leq 1{,}5$	Not Valid

The criteria used to determine whether a learner's worksheet has sufficient validity are: 1) value $\bar{A}$ for each aspect at least in the valid category, and 2) total grade point average $\bar{X}$ For all aspects on the category of quiet valid. If this is not the case, then it should be revised based on the advice of validators or by reviewing less important aspects. After that, revalidation and subsequent analysis are carried out. And so on, until the minimum M value is considered valid (Jamaluddin, 2019).

Furthermore, practical data analysis involves analyzing data on observing the implementation of student worksheets, analyzing teacher response data, and analyzing learning management data. The assessment criteria for the implementation of worksheets (Arsyad, 2016) can be seen in table 2.

Table 2. Worksheet Implementation Criteria

Interval	Kategori
$1{,}5 \leq M \leq 2$	Done All
$0{,}5 \leq M < 1{,}5$	Partially Implemented
$0 \leq M < 0{,}5$	Not Done

Data on teacher responses from teacher response questionnaires to student worksheets were analyzed using quantitative analysis (percentage). The teacher's response questionnaire is arranged based on aspects of convenience, specificity, and suitability. Finally, in looking at the implementation of learning management, categories are used as in table 3 (Jamaluddin, 2019).

Table 3. Learning Management Category

Interval	Category
$KG \geq 4{,}50$	Very Good
$3{,}50 \leq KG < 4{,}50$	Good
$2{,}50 \leq KG < 3{,}50$	Good Enough
$1{,}50 \leq KG < 2{,}50$	Less Good
$1{,}00 \leq KG < 1{,}50$	Not Good

Furthermore, there are three measurement data used to assess the effectiveness of the worksheets developed, namely on class management sheets, learning outcomes tests, and student activity observation sheets. The following categories of student activity percentages (Suparmini, 2021), can be seen in table 4.

Table 4. Student Activity Categories

Interval	Kategori
85% - 100%	Very Active
75% - 84%	Active
65% - 74%	Simply Active
45% - 64%	Less Active
0% - 44%	Inactive

Furthermore, student and teacher responses (Kartini & Putra, 2020), can be categorized as in table 5.

Table 5. Student and Teacher Response Criteria

Interval Skor (%)	Kategori
81% - 100%	Sangat Baik
61% - 80%	Baik
41% - 60%	Cukup
21% - 40%	Kurang
0% - 20%	Sangat Kurang

Students' responses to teaching materials are described to analyze their responses. After the teaching and learning activities are completed, students are given questionnaires to fill out. If the average percentage of responses from learners is greater than 70%, it is considered positive (Basri, 2019).

Descriptive statistics are used in quantitative data analysis to illustrate the level of understanding of students to set material after learning mathematics using worksheets that follow the standard categorization of the Ministry of Education, which is as follows:

1. Ability 91% - 100% or score 91 - 100 is categorized as very high
2. Ability 75% - 90% or score 75 - 90 is categorized as high
3. Ability 60% - 74% or score 60 - 74 is categorized as medium
4. Ability 40% - 59% or 40 - 59 is categorized as low
5. Ability 0% - 39% or score 0 - 39 is categorized as very low

Analysis of student learning outcomes is directed at achieving individual or classical learning outcomes. A student can be said to be complete if he obtains a minimum score of 75. Learning is said to be completed individually if 70% of the total students who take part in learning obtain a minimum score of 75. Worksheets will be said to be effective if the three effectiveness criteria above are the ability of educators to manage learning, student activities, and learning outcomes tests.

RESULTS AND DISCUSSION

Student worksheets with a realistic mathematics education approach have been developed and researched concerning the ADDIE development model which has stages, namely the analysis stage, design stage, development stage, implementation stage, and evaluation stage.

1. Analyze

The analysis stage is the initial stage of research. The stage is to start with finding problems in the learning process because there is no special use of

worksheets. The analysis is carried out specifically on mathematical subjects. Needs analysis includes performance analysis, learner analysis, learning material analysis, and learning objectives analysis.

a. Performance Analysis

Performance analysis aims to find out problems that occur in schools, especially in mathematics learning in the classroom. Observation is carried out through interviews and observations with teachers. The results of observations show that in the learning process, there are still students who find it difficult to understand mathematics lessons. In addition, there is still a lack of interaction between educators and students, resulting in monotonous learning. In learning at SMP Negeri 23 Sinjai still uses the 2013 curriculum. The method used during learning is the lecture method.

b. Student Analysis

In this study, the subjects used were grade VII students of SMP Negeri 23 Sinjai with an age range of 12-14 years. Where the age is already in the early adolescent stage. According to (Sukmadinata, 2010), adolescent children are able to think deductively, inductively, analyze, think abstractly, and solve problems. From this, it is intended that during the learning process, students want to form knowledge obtained from knowledge according to age maturity. However, the conditions in the field found by researchers, when the teacher's learning process is more active than the student's, in other words, students are not able to explore their abilities.

c. Learning Materials Analysis

Material analysis is carried out to determine and determine as well as compile and systematically detail the relevant material. The material used in this study is set material. The researcher divides the discussion into 2 sub-materials, namely the concept of set and the relationship between sets and set operations.

2. Design

This stage is a stage that contains worksheet design activities with a realistic mathematical education approach using the live worksheet application where at this stage the shape or model of the worksheet to be developed is determined. The results of the analysis stage are used as a basis for making designs. The structure of student worksheets generally consists of an opening part, namely the cover, preface, table of contents, and instructions for using the worksheet. The content section includes content competencies,

basic competencies, indicators, RME approach steps, and sub-materials consisting of learning instructions, basic competencies, learning objectives, supporting information, activities, and exercises.

The title, author, editor, and usage level of the worksheet are displayed on the front cover. An overview of the worksheets developed and the researcher's expectations for constructive criticism and suggestions are listed in the preface. To make it easier for readers to determine the content used in the worksheet, the worksheet description is included in the table of contents. The worksheet usage guide contains an overview of the sections contained in the worksheet. The steps of Realistic Mathematics Education are divided into five parts, namely, understanding contextual problems, explaining contextual problems, solving contextual problems, comparing and discussing answers, and concluding.

3. Develop

a. Student Worksheet Design

There is an initial design for making worksheets with a realistic mathematics education approach, including the following:

1) Student Worksheet Cover

The cover page consists of the title, image, name of the author, editor, and level of use of the worksheet. The image and layout of the title on the cover and others are arranged as attractively as possible so that students are interested in viewing and studying the worksheet. The display on the worksheet cover is.

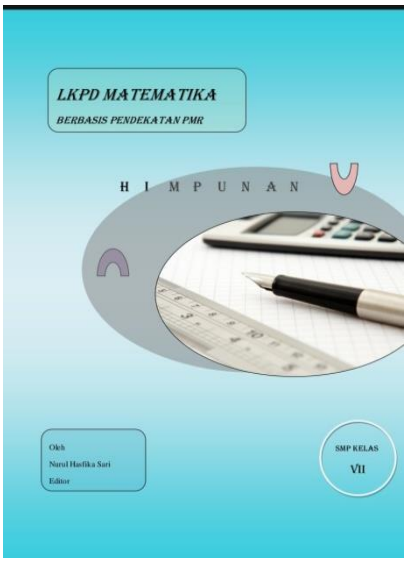


Figure 1. Worksheet Cover

2) Preface

The preface contains expressions of gratitude to Allah SWT, the author's purpose in compiling worksheets, and researchers' expectations regarding input and constructive criticism. Here's what the preface to the worksheet looks like.

KATA PENGANTAR

Puji syukur penulis panjatkan atas Rahmat Allah SWTyang telah memberikan Karunia-Nya, sehingga penulis dapat menyelesaikan penyusunan Lembar Kerja Peserta Didik (LKPD) berbasis pendekatan Pendidikan Matematika Realistik (PMR) ini dengan baik. Lembar kerja ini disusun secara bertahap oleh penulis dengan tujuan penyusunan lembar kerja ini adalah untuk memenuhi tugas akhir Skripsi Jurusan Pendidikan Matematika Universitas Islam Negeri Alauddin Makassar. Selain itu, lembar kerja ini bertujuan untuk mempermudah peserta didik dalam memahami materi pelajaran matematika khususnya pokok bahasan himpunan kelas VII SMP .

Penyusunan isi LKPD ini berdasarkan langkah-langkah pendekatan Pendidikan Matematika Realistik (PMR) dengan tujuan untuk melatih peserta didik memecahkan masalah kontekstual yang berkaitan dengan matematika. Penyampaian petunjuk lembar kerja ini menggunakan bahasa sederhana dan serta dilengkapi dengan beberapa komponen ilustrasi pendukungnya yang sesuai dengan kehidupan sehari – hari, tujuannya untuk menarik perhatian peseta didik dalam mempelajari materi secara mendalam .

Penulis menyadari sepenuhnya bahwa lembar kerja peserta didik ini masih jauh dari kata sempurna. Oleh karena itu, kritik dan saran yang relevan dengan penulis harapkan untuk memberikan revisi yang membangun.

Samata, ... 2023

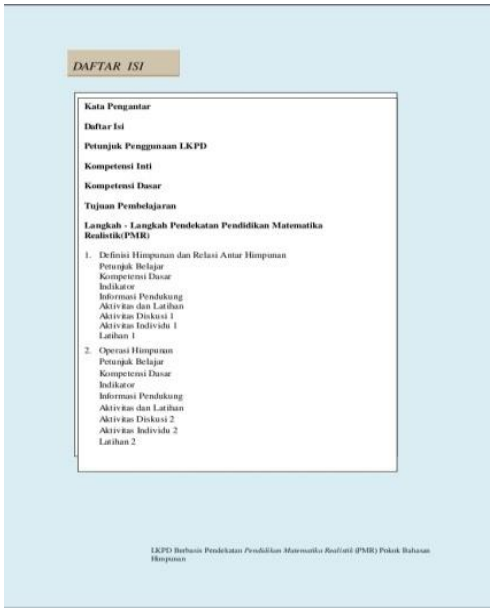
Penulis

LKPD Berbasis Pendekatan *Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Figure 2. Worksheet Preface

3) Tabel of Contents

The table of contents contains the order of the material contained in the worksheet. The following is a look at the table of contents that has been designed.



DAFTAR ISI

Kata Pengantar

Daftar Isi

Petunjuk Penggunaan LKPD

Kompetensi Inti

Kompetensi Dasar

Tujuan Pembelajaran

Langkah - Langkah Pendekatan Pendidikan Matematika Realistik(PMR)

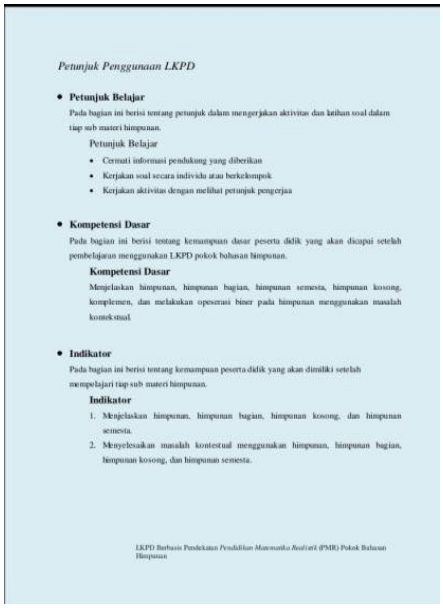
1. Definisi Himpunan dan Relasi Antar Himpunan
   - Petunjuk Belajar
   - Kompetensi Dasar
   - Indikator
   - Informasi Pendukung
   - Aktivitas dan Latihan
   - Aktivitas Diskusi 1
   - Aktivitas Individu 1
   - Latihan 1
2. Operasi Himpunan
   - Petunjuk Belajar
   - Kompetensi Dasar
   - Indikator
   - Informasi Pendukung
   - Aktivitas dan Latihan
   - Aktivitas Diskusi 2
   - Aktivitas Individu 2
   - Latihan 2

LKPD Berbasis Pendekatan *Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Figure 3. Table of Contents of Worksheet

4) Worksheet Usage Guide

The worksheet usage instructions section contains an overview of what's contained in the worksheet. Here's what the instructions for using the predesigned worksheet look like.



Petunjuk Penggunaan LKPD

- **Petunjuk Belajar**

Pada bagian ini berisi tentang petunjuk dalam mengerjakan aktivitas dan latihan soal dalam tiap sub materi himpunan.

Petunjuk Belajar

- Cermati informasi pendukung yang diberikan
- Kerjakan soal secara individu atau berkelompok
- Kerjakan aktivitas dengan melihat petunjuk pengerjaa

- **Kompetensi Dasar**

Pada bagian ini berisi tentang kemampuan dasar peserta didik yang akan dicapai setelah pembelajaran menggunakan LKPD pokok bahasan himpunan.

Kompetensi Dasar

Menjelaskan himpunan, himpunan bagian, himpunan semesta, himpunan kosong, komplemen, dan melakukan opeserasi biner pada himpunan menggunakan masalah kontekstual.

- **Indikator**

Pada bagian ini berisi tentang kemampuan peserta didik yang akan dimiliki setelah mempelajari tiap sub materi himpunan.

Indikator

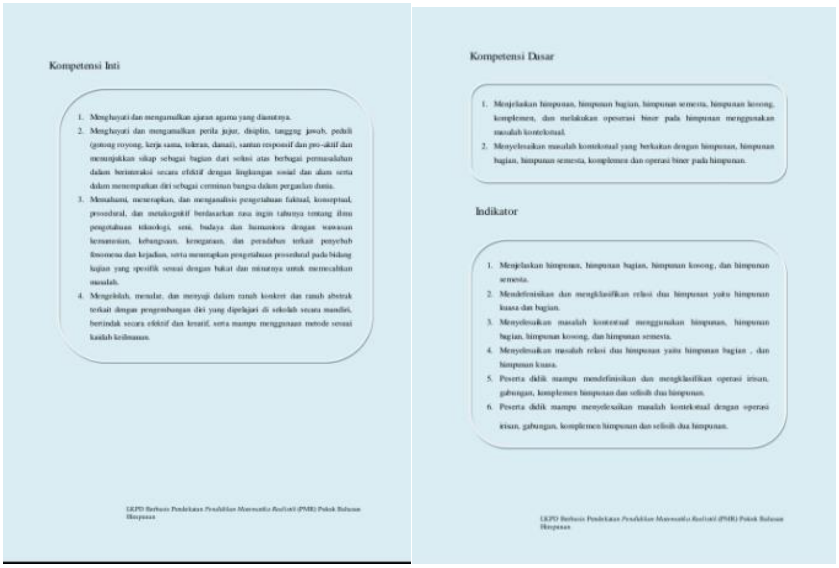
1. Menjelaskan himpunan, himpunan bagian, himpunan kosong, dan himpunan semesta.
2. Menyelesaikan masalah kontestual menggunakan himpunan, himpunan bagian, himpunan kosong, dan himpunan semesta.

LKPD Berbasis Pendekatan *Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Figure 4. Worksheet Usage Guide

5) Core Competencies, Basic Competencies, and Indicator

The following are parts of the core competencies, basic competencies, and indicators that have been designed.



Kompetensi Inti

1. Menghayati dan mengamalkan ajaran agama yang dianutnya.
2. Menghayati dan mengamalkan perila jujur, disiplin, tanggung jawab, peduli (gotong royong, kerja sama, toleran, damai), santun responsif dan pro-aktif dan menunjukkan sikap sebagai bagian dari solusi atas berbagai permasalahan dalam berinteraksi secara efektif dengan lingkungan sosial dan alam serta dalam menempatkan diri sebagai cerminan bangsa dalam pergaulan dunia.
3. Memahami, menerapkan, dan menganalisis pengetahuan faktual, konseptual, prosedural, dan metakognitif berdasarkan rasa ingin tahunya tentang ilmu pengetahuan teknologi, seni, budaya dan humaniora dengan wawasan kemanusian, kebangsaan, kenegaraan, dan peradaban terkait penyebab fenomena dan kejadian, serta menerapkan pengetahuan prosedural pada bidang kajian yang spesifik sesuai dengan bakat dan minatnya untuk memecahkan masalah.
4. Mengolah, menalar, dan menyaji dalam ranah konkret dan ranah abstrak terkait dengan pengembangan diri yang dipelajari di sekolah secara mandiri, bertindak secara efektif dan kreatif, serta mampu menggunakan metode sesuai kaidah keilmuan.

LKPD Berbasis Pendekatan *Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Kompetensi Dasar

1. Menjelaskan himpunan, himpunan bagian, himpunan semesta, himpunan kosong, komplemen, dan melakukan opeserasi biner pada himpunan menggunakan masalah kontekstual.
2. Menyelesaikan masalah kontekstual yang berkaitan dengan himpunan, himpunan bagian, himpunan semesta, komplemen dan operasi biner pada himpunan.

Indikator

1. Menjelaskan himpunan, himpunan bagian, himpunan kosong, dan himpunan semesta.
2. Mendefinisikan dan mengklasifikan relasi dua himpunan yaitu himpunan kuasa dan bagian.
3. Menyelesaikan masalah kontestual menggunakan himpunan, himpunan bagian, himpunan kosong, dan himpunan semesta.
4. Menyelesaikan masalah relasi dua himpunan yaitu himpunan bagian , dan himpunan kuasa.
5. Peserta didik mampu mendefinisikan dan mengklasifikan operasi irisan, gabungan, komplemen himpunan dan selisih dua himpunan.
6. Peserta didik mampu menyelesaikan masalah kontekstual dengan operasi irisan, gabungan, komplemen himpunan dan selisih dua himpunan.

LKPD Berbasis Pendekatan *Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Figure 5. Core Competencies, Basic Competencies, and Indicators

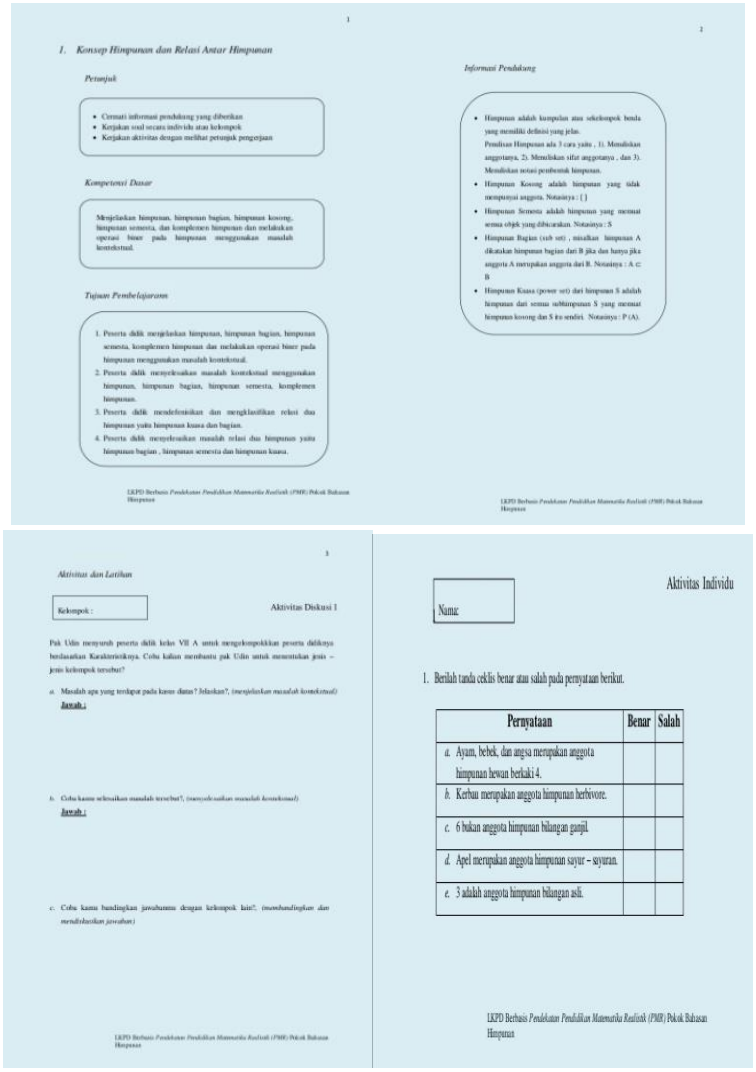
6) RME Approach Steps

The steps of the RME approach, it is divided into five parts, namely, understanding contextual problems, explaining contextual problems, solving contextual problems, comparing and discussing answers, and concluding. The following is a look at the steps of the RME approach that has been designed.

Figure 6. RME Steps

7) Student Worksheet Sub Material

The sub-material contained in the worksheet consists of several parts, namely learning instructions, basic competencies, learning objectives, supporting information, activities, and exercises. Study instructions contain directions for students in the use of worksheets. Basic competencies and learning objectives are the basis for assessing the achievement of learning outcomes and benchmarks for how far students master the material. The supporting information section contains short material that will be studied. The activity sheet contains questions that will be asked by students to get answers following the steps of the RME approach, the activity is divided into two parts, namely discussion activities and individual activities. The practice sheet contains questions to determine the level of understanding of students after practicing in the activity sheet section. Here's what those sections look like in a designed worksheet.



1. *Konsep Himpunan dan Relasi Antar Himpunan*

Petunjuk

- Cermati informasi pendukung yang diberikan
- Kerjakan soal secara individu atau kelompok
- Kerjakan aktivitas dengan melihat petunjuk pengerjaan

Kompetensi Dasar

Menjelaskan himpunan, himpunan bagian, himpunan kosong, himpunan semesta, dan komplemen himpunan dan melakukan operasi biner pada himpunan menggunakan masalah kontekstual.

Tujuan Pembelajaran

1. Peserta didik menjelaskan himpunan, himpunan bagian, himpunan semesta, komplemen himpunan dan melakukan operasi biner pada himpunan menggunakan masalah kontekstual.
2. Peserta didik menyelesaikan masalah kontekstual menggunakan himpunan, himpunan bagian, himpunan semesta, komplemen himpunan.
3. Peserta didik mendefenisikan dan mengklasifikan relasi dua himpunan yaitu himpunan kuasa dan bagian.
4. Peserta didik menyelesaikan masalah relasi dua himpunan yaitu himpunan bagian , himpunan semesta dan himpunan kuasa.

LKPD Berbasis *Pendekatan Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Informasi Pendukung

- Himpunan adalah kumpulan atau sekelompok benda yang memiliki definisi yang jelas.
  Penulisan Himpunan ada 3 cara yaitu , 1). Menuliskan anggotanya, 2). Menuliskan sifat anggotanya , dan 3). Menuliskan notasi pembentuk himpunan.
- Himpunan Kosong adalah himpunan yang tidak mempunyai anggota. Notasinya : { }
- Himpunan Semesta adalah himpunan yang memuat semua objek yang dibicarakan. Notasinya : S
- Himpunan Bagian (sub set) , misalkan himpunan A dikatakan himpunan bagian dari B jika dan hanya jika anggota A merupakan anggota dari B. Notasinya : A ⊂ B
- Himpunan Kuasa (power set) dari himpunan S adalah himpunan dari semua subhimpunan S yang memuat himpunan kosong dan S itu sendiri. Notasinya : P (A).

LKPD Berbasis *Pendekatan Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Aktivitas dan Latihan

Kelompok :

Aktivitas Diskusi 1

Pak Udin menyuruh peserta didik kelas VII A untuk mengelompokkikan peserta didiknya berdasarkan Karakteristiknya. Coba kalian membantu pak Udin untuk menentukan jenis – jenis kelompok tersebut?

a. Masalah apa yang terdapat pada kasus diatas? Jelaskan?, *(menjelaskan masalah kontekstual)*
Jawab :

b. Coba kamu selesaikan masalah tersebut?, *(menyelesaikan masalah kontekstual)*
Jawab :

c. Coba kamu bandingkan jawabanmu dengan kelompok lain?. *(membandingkan dan mendiskusikan jawaban)*

LKPD Berbasis *Pendekatan Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Aktivitas Individu

Nama:

1. Berilah tanda ceklis benar atau salah pada pernyataan berikut.

Pernyataan	Benar	Salah
a. Ayam, bebek, dan angsa merupakan anggota himpunan hewan berkaki 4.		
b. Kerbau merupakan anggota himpunan herbivore.		
c. 6 bukan anggota himpunan bilangan ganjil.		
d. Apel merupakan anggota himpunan sayur – sayuran.		
e. 3 adalah anggota himpunan bilangan asli.		

LKPD Berbasis *Pendekatan Pendidikan Matematika Realistik* (PMR) Pokok Bahasan Himpunan

Figure 7. Worksheet Sub Material

b. Instrument Development

The instruments used in trials are instruments of practicality and effectiveness. The practicality instrument consists of an ability sheet in managing learning, and a teacher response questionnaire, while the effectiveness instrument consists of a student activity sheet, a student response questionnaire, and a learning outcome test. This instrument was then validated by three validators

The following are the results of the validation analysis and some revisions that have been made.

Table 6. Validation Result

Validated Devices	Validation Results
Student Activity Sheets	The assessment entered should follow the learning model used.

After revision of the validation results that are still lacking, the validation results on research instruments are obtained as follows.

Table 7. Results of Research Instrument Validation Analysis

Validation Sheet	Indicator	Valuation	Information
Student Worksheet	1. Contents Components	3.43	Valid
	2. Serving Components	3.67	Very Valid
	3. Language Components	3.56	Very Valid
	4. Design Components	3.44	Valid
	Average	**3.53**	**Very Valid**
Student Response Questionnaire	1. Aspect of Instructions	3.67	Very Valid
	2. Content Aspect	3.5	Very Valid
	3. Language Aspect	3.67	Very Valid
	Average	**3.61**	**Very Valid**
Teacher Response Questionnaire	1. Aspect of Instructions	3.67	Very Valid
	2. Content Aspect	3.83	Very Valid
	3. Language Aspect	3.67	Very Valid
	Average	**3.72**	**Very Valid**
Learning Implementation Design	1. Formulation of Learning Objectives	3.42	Valid
	2. Contents Presented	3.58	Very Valid
	3. Language	3.56	Very Valid
	4. Time	3.67	Very Valid
	Average	**3.56**	**Very Valid**
Peseta Didik Activity Observation Sheet	1. Aspect of Instructions	3.67	Very Valid
	2. Content Aspect	3.67	Very Valid
	3. Language Aspect	3.67	Very Valid
	Average	**3.67**	**Very Valid**
Learning Management Observation Sheet	1. Aspect of Instructions	3.67	Very Valid
	2. Learning Activities and Atmosphere	3.67	Very Valid
	3. Language	3.44	Valid
	Average	**3.59**	**Very Valid**

Validation Sheet	Indicator	Valuation	Information
Student Worksheet Implementation Sheet	1. Aspect Instructions	3.67	Very Valid
	2. Content Aspect	3.67	Very Valid
	3. Language Aspect	3.67	Very Valid
	Average	**3.67**	**Very Valid**
Learning Outcomes Test	1. Material	3.5	Very Valid
	2. Language	3.67	Very Valid
	3. Construct	3.56	Very Valid
	4. Time	3.67	Very Valid
	Average	3.6	Very Valid
Average Instrument Validity			Very Valid

Based on the results of the assessment conducted by experts, it is shown in table 7 that worksheet validation is in the very valid category because each aspect reaches an average of 3.53 and enters at intervals $3.5 \leq M \leq 4$. Meanwhile, in student response questionnaires, teacher response questionnaires, lesson plans, student activity worksheets, learning management observation sheets, worksheet implementation sheets, and learning outcome tests, it can be seen that the indicators are in the very valid category because every aspect of the type of device reaches an average above 3.5.

4. Implement

The implementation stage is carried out in the framework of testing products that have been developed. Data collected through stages is used to see the practicality and effectiveness of products that have been developed.

a. Practicality Analysis

Data to show the practicality of Student Worksheets are obtained in activities carried out by teachers, including the results of observations of teachers' abilities in managing learning, as well as the results of questionnaire analysis of teacher responses to worksheets with a realistic mathematics education approach.

1) Result of Analysis of Teacher Ability in Managing Learning

The purpose of analyzing the teacher's ability to manage learning is to determine the extent of the teacher's ability to manage mathematics learning using worksheets in class. The description of the results of the analysis of the teacher's ability to manage learning can be seen in table 8.

Table 8. Results of Analysis of Teacher Ability in Managing Learning

Observation Aspect	Average Meeting Aspects	Information
Initial Activities	3.6	Good
Core Activities	3.67	Good
Final Activities	3.78	Good
Classroom Atmosphere	3.80	Good
Average	3.71	Good

Based on the results of data analysis, the ability to manage mathematics learning using worksheets in the trial obtained an average score of teacher ability to manage learning 3.71 which is on good criteria.

2) Teacher Response Analysis Result

Questionnaires of teacher responses to Student Worksheets with a realistic mathematical education approach model were given to subject teachers at the school where the trial was tested. The teacher response questionnaire was given after the entire series of learning processes using worksheets with a realistic mathematics education approach had been completed.

The teacher's response questionnaire was given to the teacher after observing the worksheet with the RME approach. The results of the analysis are.

Table 9. Results of Teacher Response Questionnaire Analysis

Number	Interval	Category	Frequency	Percentage
1	81% - 100%	Very Good	1	88%
2	61% - 80%	Good	0	0%
3	41% - 60%	Good Enough	0	0%
4	21% - 40%	Less Good	0	0%
5	0% - 20%	Very Less Good	0	0%

In table 9, it can be seen that the percentage of teacher responses with very good categories to worksheets is 88% and negative responses are 0%. The data showed that the teacher's response to the worksheets entered in the category was very good.

Based on the practicality component, namely the ability sheet in managing learning, and teacher response questionnaires, the results of the analysis of these components showed a very positive response to the

worksheets used. Thus, it can be said that the developed Student Worksheets meet practical criteria.

b. Effectiveness Analysis

Effectiveness data can be measured from activities carried out by students, namely analysis of conservation of student activities in the learning process, analysis of student response questionnaires, and learning outcome tests.

c. Result of Student Activity Analysis

Activities carried out by students during the learning process that is observed directly by observers consist of 7 criteria, namely: 1) students listen to the teacher explaining the learning material, 2) students ask questions about material that has not been understood, 3) students answer questions or questions asked by the teacher, 4) students ask for guidance or assistance in doing practice questions in worksheets, 5) students actively discuss with group mates and write the answers on worksheets, 6) students present the worksheets they have worked on and other groups respond, and 7) students provide conclusions/responses after learning. The results of the analysis of student activities during the learning process can be seen in the following table.

Table 10. Result of Student Activity Analysis

Number	**Aspects of Observing Student Activities**	**Percentage (%) of Meetings to**		
		1	**2**	**3**
1	Students listen to the teacher explain the learning material.	88	92	88
2	Students ask questions about material that is not yet understood.	80	96	92
3	Students answer questions or questions asked by the teacher.	76	80	80
4	Students ask for guidance or help in doing practice questions on Student Worksheets	88	76	84
5	Students actively discuss with group mates and write the answers on Student Worksheets	84	92	88
6	The student presents the Student Worksheet he has worked on and the other group responds.	88	76	96
7	Learners provide conclusions/responses after learning.	68	80	92
Average Percentage of Each Meeting		81,7	84.6	88.5
Total Percentage of Each Meeting				**85%**

Based on the results of the analysis in table 10, it can be seen that during the learning process using Student Worksheets, students look active. The percentage of student activity is 85% very active.

d. Result of Student Response Questionnaire Analysis

Student response questionnaires to Student Worksheets with a realistic mathematics education approach are given to students after the learning process using worksheets with a realistic mathematics education approach has been completed. The questionnaire was distributed to class VII C participants as many as 25 people who were declared active as test subjects of the developed worksheets.

Based on the questionnaire given to students after participating in learning using Student Worksheets with the RME approach, the results of the analysis are.

Table 11. Result of Student Response Questionnaire Analysis

Number	Interval	Category	Frequency	Percentage
1	81% - 100%	Very Good	23	92%
2	61% - 80%	Good	2	8%
3	41% - 60%	Good Enough	0	0%
4	21% - 40%	Less Good	0	0%
5	0% - 20%	Very Less Good	0	0%
Average Aspects				87%

In table 11, it can be seen that the percentage of student responses to excellent Student Worksheets is 92%, good responses are 8%, and negative responses are 0%. The data shows that students' response to worksheets is very good.

e. Learning Outcomes Test

Learning outcome test data is used to determine the level of student's comprehension ability in the set material after learning using Student Worksheets. The test result data is then analyzed and converted into predetermined categories. The results of data analysis of mathematics learning outcomes tests using worksheets are.

Table 12. Learning Outcomes Test Analysis Result

Number of Questions	Value	Frequency	Percentage (%)	Category
7 Questions	91 – 100	0	0%	Very High
	75 – 90	22	88%	High
	60 – 74	3	12%	Medium
	40 – 59	0	0%	Low
	0 – 39	0	0%	Very Low
	Number of Students	25	100%	
	Average Value		80	High

Based on the results of the analysis in table 12, it can be seen that in the students' comprehension ability of the set material after learning using the Student Worksheet, 22 students fall into the high category and 3 students fall into the medium category. Based on the average score of students, it can be said that the student's comprehension ability is in the high category.

5. Evaluate

The evaluation stage is the final stage of the ADDIE development model used in developing Student Worksheets with a realistic mathematics education approach. At this stage, only minor revisions were made to the worksheet based on the input provided as a refinement of deficiencies during the trial process. This is done to produce a decent product.

The development of Learner Worksheets is carried out using the ADDIE model which has gone through several stages, starting from the analysis stage, design stage, development stage, implementation stage, and evaluation stage to produce teaching material in the form of learner worksheets with a realistic mathematics education approach. The worksheet designed contains set material for grade VII junior high school education level. This Learner Worksheet with a Realistic Mathematics Education approach is designed to facilitate students in their learning process. The characteristic of this Learner Worksheet is the use of the Realistic Mathematics Education approach which presents contextual problems in learning so that students more easily understand the concepts in learning. Furthermore, the novelty of

this research is that the Learner Worksheets developed are Learner Worksheets that use the LiveWorksheet application, whereas Learner Worksheets that use the LiveWorksheet application can make it easier for students to learn independently anywhere and anytime.

Based on the analysis of validity, practicality, and effectiveness, the developed Learner Worksheet has met these three criteria. This is in line with the research of Sitepu (2024), Ningrum, Siregar, and Panjaitan (2023), Jannati, Isnaini, and Afgani (2017), Warni, Pangaribuan, and Hutauruk (2022), Ariani, Zulkarnain, and Hidayanto (2023) who have developed Learner Worksheets with a Realistic Mathematics Education approach and have met the criteria of validity, practicality, and effectiveness.

The results showed that the use of Learner Worksheets with a Realistic Mathematics Education approach has a significant potential impact on improving the quality of mathematics learning. This approach makes mathematical concepts more contextual and relevant to students so that they can relate the subject matter to real-life situations (Sitepu, 2024). This has the potential to increase in-depth understanding of concepts and reduce misconceptions that often occur in traditional math learning.

In addition, this approach can also increase learners' active involvement in the learning process. By using worksheets designed based on real situations, learners are more motivated to participate and find solutions independently, which in turn can increase learning independence and critical thinking skills. As stated by Wewe and Bhoke (2022) in their research the Learner Worksheets they developed encourage students to be actively involved in the learning process, as well as improve students' critical thinking skills. The use of these worksheets can also assist teachers in providing more structured and systematic exercises, which are essential for measuring and evaluating learners' understanding thoroughly. Thus, teachers can more easily identify areas that need further reinforcement, so that they can provide appropriate interventions.

CONCLUSION

Based on the results of research and discussion, it was concluded that Student Worksheets using the Realistic Mathematics Education approach had met the categories of validity, practicality, and effectiveness. Therefore, research products in the form of Student Worksheets using a Realistic Mathematics Education approach can be used as mathematics learning

materials in the classroom. The application of Student Worksheets with the Realistic Mathematics Education approach is expected to improve the understanding of mathematical concepts more deeply and contextually for students. This approach can also encourage learning that is more interactive and relevant to everyday life, thus motivating students to be more active and enthusiastic in learning mathematics.

However, some shortcomings need to be considered related to the trial process of the Learner Worksheets that have been developed only involving small-scale subjects, so the results are not fully representative of a wider population. Therefore, future researchers are advised to carry out similar developments with test subjects on a larger scale to obtain more comprehensive and representative data.

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