Student Worksheet Based on Realistic Mathematics Education Approach on Multiplication and Division Material for Grade V Elementary School

Dinda Monika[1*], Zaka Hadikusuma Ramadan[2]

[1,2] Pendidikan Guru Sekolah Dasar, Universitas Islam Riau, Pekanbaru, Indonesia

A B S T R A K

Guru belum menyediakan Lembar Kerja Peserta didik (LKPD) berbasis pendekatan Realistic Mathematic Education (RME). Hal ini berdampak pada rendahnya pemahaman siswa kelas V. Penelitian ini bertujuan untuk mengembangkan LKPD Berbasis Pendekatan realistic mathematic education (RME) serta untuk menganalisis pengembangan validitas LKPD berbasis pendekatan realistic mathematic education (RME) pada materi perkalian dan pembagian pecahan siswa kelas V sekolah dasar. Jenis Penelitian ini adalah penelitian pengembangan dengan menggunakan prosedur ADDIE. Metode yang digunakan dalam pengumpulan data yaitu wawancara, dokumentasi, dan kuisioner. Instrument pengumpulan data berupa angket. Teknik analisis data yaitu analisis deskriptif kualitatif dan metode analisis deskriptif kuantitatif. Hasil penelitian yaitu menunjukan bahwa LKPD berbasis pendekatan realistic mathematic education (RME) valid dari ahli materi, ahli media, ahli desain pembelajaran, dan ahli bahasa. Kesimpulan dari penelitian ini adalah bahwa media pembelajaran berupa LKPD berbasis pendekatan realistic mathematic education (RME) layak dan efektif untuk digunakan dalam proses pembelajaran matematika khususnya pada materi perkaian dan pembagian pecahan.

A B S T R A C T

Teachers have not provided Student Worksheets based on the Realistic Mathematical Education (RME) approach. This has an impact on the low understanding of fifth-grade students. This study aims to develop worksheets based on the realistic mathematic education (RME) approach and analyze the development of worksheet validity based on practical mathematic education (RME) approach on multiplication and fraction division material for fifth-grade elementary school students. This type of research is development research using the ADDIE procedure. The methods used in data collection are interviews, documentation, and questionnaires. The data collection instrument is in the form of a questionnaire. Data analysis techniques are qualitative descriptive analysis and quantitative descriptive analysis methods. The results showed that the worksheet based on a realistic mathematical education (RME) approach was valid from the material, media, learning design, and language experts. This study concludes that the learning media in the form of a worksheet based on a realistic mathematical education (RME) approach is feasible and effective in the mathematics learning process, especially in equations and fraction division.

1. INTRODUCTION

Education is a conscious and planned effort made to create a learning atmosphere so that students can develop their potential so that they have religious, spiritual knowledge, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and country (Kadi & Awwaliyah, 2017; Primasari &, Zulela, 2019; Winata & Friantini, 2018). Learning is effective if students are directly involved in the learning process and can seek experience and connect directly in the learning process (Kasih, 2017; Nataliya, 2015; Sari & Yuniati, 2018). The purpose of education is to educate the nation's life and develop complete human beings, namely those who believe and are devoted to God Almighty and have a noble character, have knowledge and skills, physical and spiritual health, a solid and

Corresponding author
*E-mail addresses: monika99@gmail.com (Dinda Monika)

independent personality, and a sense of national social responsibility (Bhoke, 2020; Faisal & Sulkipani, 2016; Kadi & Awwaliyah, 2017). One of the efforts to get an education is through the learning process at school. Learning is an activity carried out in the classroom environment with teaching activities carried out by educators and the quality of learning activities carried out by students accompanied by elements of developing a positive attitude towards learning carried out (Farhani, 2019; Haryoko & Jaya, 2017; Muradi et al., 2021; Rachmadyanti, 2017). The learning process carried out becomes meaningful, so one of the efforts made by the teacher is to design worksheets using an attractive learning model (Pentury et al., 2019; Rewatus et al., 2020). Based on the initial observations conducted at the elementary school in Tanah Datar Regency, the SD found several problems, namely not providing Student Worksheets based on the Realistic Mathematical Education (RME) approach and the low understanding of fifth-grade students regarding multiplication and division in mathematics. Previous research also stated that many teachers still have difficulty making worksheets (Mustika & Susanti, 2020). Other research findings also state that many teachers still have difficulty developing math worksheets (Gustin et al., 2020; Sari et al., 2020; Septian et al., 2019). Based on these observations, this research to develop a worksheet Based on the Realistic Mathematics Education Approach on Multiplication and Fraction Division Materials and determine the development of worksheet validity based on the Realistic Mathematics Education Approach Multiplication and Fraction Division Materials for fifth-grade elementary school students.

The worksheet is defined as printed teaching material in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that students must do concerning the Basic Competencies that must be completed (Istikharah, 2017; N. M. Sari et al., 2020; Yuliarni, 2021). The worksheet is considered one of the right learning alternatives for students (Kinanti et al., 2021; Mustika & Susanti, 2020; Pentury et al., 2019). The elements in the worksheet include titles, study instructions, learning indicators, supporting information, work steps, and assessments. The requirements that must be possessed in preparing the worksheet are didactic, construction, and technical. WORKSHEET is an example of teaching materials that schools often use to facilitate learning. It is equipped with procedures for its use ad contains brief material and practice questions (Anggraini et al., 2017; Gustin et al., 2020). The worksheet is a learning media in the form of student activity task sheets by the SK-KD and contains information or instructions for students in solving a problem (Fitriyah & Wardana, 2019; Rahma Oktaviani & Zulfah, 2020).

One model that can be applied to the development of worksheet that leads to contextual problems is Realistic Mathematics Education (RME). RME is a mathematics learning approach that uses everyday problems in the learning process. The learning is student-centered to make it easier for students to understand the material presented (Aldila, 2017; Dehani, 2019; Syamsudin et al., 2018). The realistic approach is very suitable for learning mathematics because it has characteristics and principles that allow students to develop optimally with freedom of thought and express opinions on problem-solving (Astari, 2017; Hanifah et al., 2019; Lestariningsih & Trismawati, 2020). One of the purposes of using problems in everyday life is to make it easier for students to understand the concepts and purposes of learning (Wulandari et al., 2020; Yusmaniar, 2017). The learning approach based on the Realistic Mathematics Education approach can be applied in the Student Worksheet. Realistic Mathematics Education (RME) was developed based on the thoughts of Hans Freudenthal (1905 – 1990), a German/Dutch writer, educator, and mathematician who argued that "mathematics is a human activity and must be linked to reality (Laurens et al., 2018; Purwitaningrum & Prahmana, 2021). Realistic Mathematics Education in Indonesia is better known as an approach that aims to motivate students to understand mathematical concepts by relating these concepts to problems in everyday life (Anggraeni et al., 2021; Kowiyah et al., 2019; Septian et al., 2019). So the RME approach is learning mathematics at an educational level that is used to connect the concepts of everyday/real life so that students can find concrete learning concepts by exploring real problems with the help and guidance of the teacher (Ananda, 2018; Atikah et al., 2020; Ediyanto et al., 2020; Gustin et al., 2020).

Other previous research findings also state that Student Worksheets (LKS) Based on Realistic Mathematics Education (RME) Approaches are suitable for use in the learning process (Halija et al., 2021). Other research findings also state that the Realistic Mathematics Education Approach can improve students' understanding of mathematics (Faidah et al., 2019; Hidayat et al., 2020; Trimahesri & Hardini, 2019). No study on student worksheets based on a realistic mathematics education approach for fifth-grade elementary school multiplication and division material. This study aims to develop worksheet based on a realistic mathematical education (RME) approach. It is hoped that the worksheet Based on the Realistic Mathematical Education (RME) approach can improve students' multiplication and fraction division materials for fifth-grade elementary school students.

2. METHOD

The type of research design used is research & development (R&D) (Duwi Liana Anggela, Tio Gusti Satria, 2021; Rasvani & Wulandari, 2021). This research was conducted at SDN 03 Salimpaung. The subject of this research is an expert validator to test the validator of the developed learning media, which consists of 6 validators (Melihayatri & Ramadan, 2019). The object of this research is a worksheet based on a realistic mathematic education approach to the material of multiplication and division of fractions for fifth-grade students of SDN 03 Salimpaung. In this study, the assessment process for the worksheet was carried out using the Likert scale and the Guttman scale. The learning media development in this study was carried out according to the ADDIE model's research and development procedures. This study uses four stages, namely: first, analysis. At the analysis stage, observations were made through interviews to analyze learning needs and learning materials at the research site. Second, the design (designing) carries out a product design accompanied by an explanation of the material packaged in an attractive student worksheet. Third, Development at this stage carried out a trial process by experts, including material experts, linguists, and design experts, to determine the validity of the products that have been developed. Then after the product has received input from the experts, a product revision is carried out until the product is declared truly valid. Fourth, implementation, this stage is carried out to obtain teacher and student responses from products that have been developed by giving teacher and student response questionnaires. The instruments are presented in Table 1, Table 2, and Table 3.

Table1. Worksheet Validation Instrument

Assessment aspects	Indicator
Content	a. The suitability of the material with basic competencies and indicators
	b. The suitability of the material with learning
	c. Consistency between material and evaluation following basic competencies and indicators
	d. Material accuracy
	e. Clarity of material concept
	f. Ease of understanding the material
	g. Clarity of material delivery
	h. Material appeal
	i. Completeness of material content
Language	a. The language used is straightforward
	b. EYD compatibility
	c. Understanding of messages and information
	d. Compatibility with the intellectual development of students
	e. Ability to encourage critical thinking
	f. Coherence and cohesiveness between learning activities
	g. Consistent use of terms, symbols, and icons
Design	a. Worksheet physical size
	b. Worksheet skin layout
	c. The letters used are attractive and easy to read
	d. WORKSHEET cover illustration
	e. Cover related to fraction material
	f. Layout consistency
	g. Complete layout elements
	h. Layout speeds up understanding
	i. Easy to read
	j. Content illustration

Table 2. Teacher Response Questionnaire

Assessment aspects	Indicator
Appearance	a. Interesting worksheet cover page display
	b. Each worksheet title is displayed clearly to describe the contents of the worksheet
	c. Layout placement

Assessment aspects	Indicator
Language use	a. selection of typefaces, use of appropriate spaces to make it easier for students to read worksheet
	b. the worksheet uses language that is appropriate to the maturity level of students
	c. the worksheet uses a clear sentence structure
	d. the worksheet uses simple sentences that are easy for students to understand
Graphic component	a. The combination of pictures and writing in the worksheet attracts attention
Material component	a. Instructions for worksheet activities are clear so that it makes it easier for students to carry out all activities in the worksheet
	b. The material presented in the worksheet helps students achieve learning objectives
	c. The material presented in the worksheet follows the student's ability level
Troubleshooting	a. worksheet facilitates students in solving math problems in their way
	b. the worksheet helps students find material concepts
Convenience	a. the worksheet is easy for students to understand
	b. the worksheet is easy to implement in learning

Table 3. Student Response Questionnaire

Assessment aspects	Indicator
Student interest/worksheet appearance	a. The attractive appearance of the worksheet makes me interested in using the worksheet
	b. The topic of discussion/chapter title caught my attention to study WORKSHEET
Usage process	a. The choice of the typeface makes it easier for me to use the worksheet
	b. The worksheet uses easy-to-understand language
	c. worksheet presentation style is not boring
	d. Happy to learn mathematics, especially in multiplication and division of fractions, using this worksheet
Solution to problem	a. The material presentation system in the worksheet makes it easier for me to understand mathematics learning materials
	b. I can relate the contents of the worksheet with the things I do or think in my daily life
Benefits	a. The material presented is useful and follows competency standards and learning objectives
	b. The contents of the worksheet are very useful for me

Data collection techniques consist of three types, namely interviews, documentation, and questionnaires. First, interviews were conducted with fifth-grade teachers to find out how the students' learning conditions for mathematics subjects were whether the learning carried out had succeeded in achieving the learning objectives or not. Second, documentation is carried out to strengthen the research carried out. Documentation is used as evidence in research in the form of photos or pictures, results of interviews with class teachers, data on the number of students, and others that can support the truth of the results of interviews that have been conducted previously. Third, a questionnaire/questionnaire consisting of a validation sheet (questionnaire) addressed to material experts, linguists, design experts, and a validation response sheet addressed to teachers and students. The data analysis techniques used in this research are qualitative descriptive and quantitative descriptive (Maimunah et al., 2019). Qualitative descriptive data is used to analyze the results of product trials by material experts, linguists, and design experts in the form of comments and suggestions regarding the development of worksheets based on a realistic mathematics education approach to multiplication and division of fractions. Meanwhile, quantitative descriptive data is used to describe the validation test results and the practicality of the worksheet based on a realistic mathematics education approach. The criteria for validity and practicality are presented in Table 4 and Table 5.

Table 4. Product validation and revision level

Validation Criteria	Percentage (%)
Not valid	0-20 %
Less valid	21-40 %
Enough valid	41-60 %
Valid	61-80 %
Very valid	81-100 %

Table 5. Practicality level

Practical criteria	Percentage (%)
Very impractical	0-20 %
Less practical	21-40 %
Enough practical	41-60 %
Practical	61-80
Very practical	81-100 %

3. RESULT AND DISCUSSION

Result

Developing student worksheets based on a realistic mathematics education approach uses the ADDIE model with the stages of Analysis, Design, Development, and Implementation. Analysis Phase. At this stage of needs analysis, interviews were conducted to analyze the needs of teachers and students, subject matter, and the curriculum used. Based on the interviews with teachers, teachers have never developed worksheets based on realistic mathematical education as a learning medium. The teacher only uses theme books that are considered less attractive. The learning process carried out is not effective, and the material presented by the teacher is difficult for students to understand. This can be seen from the survey results of student tests which are still below the average. At this stage, the researcher also determines the material to be used in his research, namely the multiplication and division of fractions, and the curriculum used is the k13 curriculum. The basic competencies and indicators are presented in Table 6.

Table 6. Basic Competencies and Indicators

Basic competencies	Indicator
1. Explain and do multiplication and division of fractions	1. Doing multiplication and division of various fractions
2. Solve problems related to multiplication and division of fractions	2. Solve multiplication and division problems of fractions

Design Stage. At this stage, design a product that fits your needs. The initial design is to make a design plan. Then determine the software and hardware that will be used in product development. After that, the worksheet cover design is made according to the material and design as attractive as possible. The next stage is designing the contents of the worksheet whose presentation of the material has been adjusted to the indicators. The contents of the worksheet consist of a discussion of material supported by sample questions at the end of each discussion and equipped with practice questions. Then the last stage is to determine the product assessment instrument. Development stage. Product validation tests were carried out by six validators, ooo material experts, two design experts, and two linguists in this development stage. This validation test aims to assess the level of product validity developed. The following is the validation result of each validator based on their area of expertise. In the material expert assessment, the average score of the two material experts is 92%, with a very valid category with information suitable for use without revision. Still, there are comments and suggestions from the 2nd validator for the practice questions section, you can also use story questions, and modified question sentences be a command line. The overall average score of the two design experts is 84.11%, with a valid category, and the description is suitable for use without revision. Regarding language assessment, the overall average score of the two experts is 93.84%, with a very valid category with information suitable for use without revision. Implementation stage. At this stage, the researcher analyzed the teacher's response questionnaire and the student's response to the worksheet based on a realistic mathematics education approach. The results of the student response questionnaires are presented in Table 7.

Table 7. Student Response Questionnaire

No	Assessment Aspect	Percentage (%)	Category
1.	Student interest/worksheet view	90 %	Very practical
2.	Usage process	90 %	Very practical
3.	Solution to problem	90 %	Very practical
4.	Benefits of worksheets	90 %	Very practical
	Average	**90 %**	**Very practical**

Based on Table 7 above, student responses to the worksheet are based on a realistic mathematics education approach. In student interest/worksheet appearance, an average score of 90% is obtained in the very practical category. In the aspect of the use process, an average score of 90% was obtained with a very practical category. An average score of 90% is obtained with a very practical category in problem solving. And in the aspect of benefit, an average score of 90% is also obtained with a very practical category. Overall, the total score obtained from 18 students is 90%, categorized as very practical. The results of the teacher's responses are presented in Table 8.

Table 8. Teacher response questionnaire

No	Rated aspect	Percentage	Criteria
1.	Appearance	20 %	practical
2.	Language use	24 %	practical
3.	Graphic component	6,6 %	practical
4.	Material component	19 %	practical
5.	Problem-solving	12 %	practical
6.	Convenience	13,3 %	practical
	Average	**94,9 %**	**Very practical**

Based on Table 8, the teacher's response to the worksheet results is based on a realistic mathematics education approach. In appearance, an average score of 20% is obtained in the practical category. An average score of 24% is obtained in the practical category in language use. In the aspect of the graphic component, the average score is 6.6% in the practical category. In the aspect of the material component, an average score of 19% was obtained in the practical category. In problem-solving, an average score of 12% is obtained in the practical category. And in the aspect of convenience, the average score is 13.3% in the practical category. So overall, the total score obtained from the teacher's response is 94.9, with a very practical category.

Discussion

It can be said to have good qualifications if it has been tested by experts and is declared valid. Based on the results of the worksheet validation trials based a realistic mathematics education approach by experts and the results of teacher and student responses, the results obtained are in very good qualifications so that they are effective and practical to use in the learning process. Based on this, it means that the developed worksheet media is very suitable to be used as a learning medium for elementary school students. In theory, in learning for elementary school children, concrete objects are needed, especially in learning mathematics (Helsa et al., 2021; Mahendra et al., 2021; Nurlaily et al., 2019). Theoretically, the learning carried out for children in elementary school is very much needed supporting media that is interesting and concrete, especially in mathematics (Attard & Holmes, 2020; Fitria et al., 2018; Putra & Agustiana, 2021). The worksheet has high content validity and high response. This is because the purpose of learning in the worksheet media is by the KD, the material in the worksheet is delivered clearly and coherently, and by the level of development of student characteristics, and the explanation of the material in the worksheet can encourage students' curiosity. The validity of the contents of the worksheet media gets the validity criteria. High by material experts. A worksheet that is following the learning material will make it easier for students to learn (Anggraini et al., 2017; Mustika & Susanti, 2020; Muzayyanah et al., 2020). And the content of the material in the worksheet is displayed very clearly. Learning material presented clearly will also make it easier for students to understand it (Diani & Nurhayati, 2019; Marshel & Ratnawulan, 2020; Nurliawaty et al., 2017). Therefore, this worksheet media was developed to facilitate this because this media has several advantages over other media (Istikharah, 2017; Rahma Oktaviani & Zulfah, 2020). The advantages of this worksheet media are that it looks attractive, equipped with pictures, and a collection of practice questions at the end of the discussion of the material.

In general, the benefits of the worksheet include helping teachers prepare lesson plans and activating students in the teaching and learning process (Sari et al., 2021; Yuliarni, 2021). In addition, a worksheet also helps students obtain notes about the material to be studied through teaching and learning activities and helps students add information about the concepts studied through systematic learning activities (Fitriyah & Wardana, 2019; Putra & Agustiana, 2021). Other research findings also state that worksheet trains students to find and develop process skills, 6) activate students in developing concepts (Kinanti et al., 2021; Septian et al., 2019). RME-based worksheet encourages and challenges students to learn actively and is even expected to construct or build their knowledge. RME is a mathematics learning approach with five characteristics: using contextual problems, vertical instruments, student contributions, interactive activities, linkages (Aldila, 2017; Hidayat et al., 2020; Laurens et al., 2018). The steps in the mathematics learning process with a realistic approach are understanding contextual problems, explaining contextual problems, and solving contextual problems (Dewi & Izzati, 2020; Faidah et al., 2019). The implication of this research is the existence of worksheet media based on a realistic mathematics education approach to the material of multiplication and division of fractions in the fifth grade of elementary school with very good qualifications. This media can be used in the learning process on mathematics subjects. The teaching and learning process becomes more effective and interesting by using this worksheet media so that students will better understand the material taught by the teacher. The worksheet media based on a realistic mathematics education approach can facilitate students in the learning process that is carried out and can achieve learning objectives well.

4. CONCLUSION

The worksheet learning media based on a realistic mathematics education approach in mathematics subjects with multiplication and division of fractions for fifth-grade elementary school students was declared valid and had very good qualifications for expert trials and teacher and student responses. This shows that the worksheet developed is feasible and effective in the learning process.

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