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Developing Interactive Learning Media Based on Realistic Mathematics Education for Merdeka Curriculum in Elementary Schools

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Abstrak

Implementasi Kurikulum Merdeka menuntut perubahan pembelajaran di sekolah dasar agar menjadi lebih relevan dan interaktif. Sayangnya, masih banyak guru yang bergantung pada pembelajaran berbasis buku teks dan LKPD, tanpa menggunakan media yang dapat menggugah motivasi belajar peserta didik. Penelitian ini ditujukan untuk mengembangkan media pembelajaran interaktif berbasis *Realistic Mathematics Education (RME)* yang valid dan praktis. Jenis penelitian ini adalah pengembangan (R&D) dengan menggunakan model ADDIE. Total 79 siswa dari 3 sekolah dasar di Kota Padang menjadi subjek penelitian. Instrumen pengumpulan data yang digunakan mencakup observasi, wawancara dan kuisioner. Penelitian ini menghasilkan media pembelajaran interaktif berbasis RME untuk Kurikulum Merdeka yang sangat valid dan sangat praktis untuk digunakan pada kegiatan pembelajaran di kelas.

Kata Kunci: Media Pembelajaran Interaktif; Kurikulum Merdeka; *Realistic Mathematics Education*; RME

Abstract

The implementation of the Merdeka Curriculum demands a change in elementary school education to make it more relevant and interactive. Unfortunately, many teachers still rely on textbook-based learning and student worksheets (LKPD), without using media that can stimulate students' motivation to learn. This research aims to develop interactive learning media based on Realistic Mathematics Education (RME) that are valid and practical. This type of research is Research and Development (R&D) using the ADDIE model. A total of 79 students from 3 elementary schools in the city of Padang were the research subjects. Data collection instruments used include observations, interviews, and questionnaires. This study resulted in interactive RME-based learning media for the Merdeka Curriculum that are highly valid and highly practical for use in classroom learning activities.

Keywords: Interative Learning Media; Merdeka Curriculum; Realistic Mathematics Education; RME

I. INTRODUCTION

Education is a conscious effort to humanize individuals, requiring all stakeholders to contribute equally (Koerniantono, 2019). The National Education System aims to develop students into religious, responsible, healthy, knowledgeable, and creative individuals, as stated in Law No. 20 of 2003, Article 3. Therefore, cooperation between the government, schools, students, and parents is crucial for achieving these goals (Pasaribu, 2017).

Developing a curriculum that is relevant to the times is one of the government's efforts to achieve the goals of national education. The latest curriculum developed by the Indonesian government is the Merdeka Curriculum. The Merdeka Curriculum is a flexible and student-centered curriculum that focuses on developing students' soft skills and character, emphasizing the Pancasila learner profile (Sayfullooh et al., 2023). It allows schools to interpret the curriculum's basic competencies into assessments, resulting in more relevant and interactive learning (Rahayu et al., 2022). The advantages of the Merdeka Curriculum include simplicity, depth, a focus on essential content, and developing students' competencies. The curriculum is student-centered, allowing teachers and schools to determine appropriate learning and removing pressure to achieve minimum passing grades. It also supports the development of students' literacy and numeracy skills and knowledge in each subject (Rahmadayanti & Hartoyo, 2022). The curriculum is diverse, allowing students ample time to explore concepts and strengthen their competencies (Barlian et al., 2022).

There are many ways that teachers can implement active student learning in line with the guidelines of the Merdeka Curriculum, one of which is by using interactive learning media. Interactive media is a constructivist medium that combines text, graphics, animation, video, music, voice/narration, and sound effects to convey messages and sound (Kurniawati & Nita, 2018; Sujarwo et al., 2022). Interactive learning media is a valuable method for active student learning, as it involves both direct and indirect interactions between teachers and student (Istiqlal, 2017). It enhances the learning environment, making it more realistic (Pertiwi & Fitria, 2022; Johar et al., 2023).

Interactive learning media is a wonderful educational tool because it comes with a number of benefits. It is fun and fascinating, grabbing students' attention and encouraging positive attitudes toward learning. Additionally, it improves motivation and correlates well with mathematical communication abilities, encouraging critical thought and fostering self-directed learning. It has been demonstrated that the interactive features of media considerably enhance learning outcomes (Wardani & Subekti, 2022).

Other than instructional media, the learning approach is a crucial factor to take into account in learning activities. There are many different learning approaches that can be used, and each has advantages and disadvantages. One of these is "Realistic Mathematics Education (RME)", which has the potential to be combined with interactive learning media (Sari et al.,

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2023). Founded by mathematician Hans Freudenthal, RME is an approach to mathematics education that connects mathematics to real-world everyday life situations, promoting deeper understanding and problem-solving skills (Silvi & Auliya, 2022; Mutiarahman, Edriati, & Suryani, 2023). This approach encourages students to learn mathematics in a meaningful and relevant way by enabling them to apply theory to real-world issues. (Arcavi, 2020; Bock et al., 2020; Scherer, 2020; Meilina, Mariana, & Rahmawati, 2023).

RME is one of the effective learning approaches that helps students become more motivated, self-assured, confident, and capable of making decisions (Laurens et al., 2017; Afriansyah et al., 2023). Additionally, learning outcomes, creative thinking abilities, and mathematics understanding all improve in RME-taught students (Sitorus & Masrayati, 2016; Syafriafdi et al., 2019; Widada et al., 2018; Sukmaningthias et al., 2023). RME also has a positive impact on students character (Palinussa, 2013; Suwanto et al., 2023).

Based on the various advantages of interactive learning media and the RME approach described above, we are interested in developing a product that combines the two. This advancement aims to help with two things: fixing school learning problems and expanding knowledge in the field of mathematics education in elementary schools.

First, consider the issue in schools. Based on our observations and surveys done in three different schools, we discovered that teachers rarely use learning media and frequently rely on textbooks and worksheets (LKPD) in their teaching activities. As a result, pupils believe mathematics to be boring and difficult. Furthermore, we noticed that many students struggle to understand and apply their mathematical knowledge, especially in plane geometry areas.

Second, knowledge improvement in the field of mathematics education in elementary shools. We discovered that very few studies combine interactive learning media and the RME approach. Some studies, such as those conducted by Maria and Wahyudi (2016) on thematic learning, Purnama and Pramudiani (2021) on fractions, and Faqih et al. (2021) on plane geometry and solid shape has validated the usefulness of interactive learning media in elementary schools. However, none of them have combined interactive learning media with the RME approach as we developed. Furthermore, the product we developed is intended for use in the Merdeka Curriculum, the most recent curriculum approved by the government.

To clarify the research focus, we will restrict our investigation to two aspects: validity and practicability. As a result, the product we develop will be an interactive learning media based on RME that is both valid and practical for use in school teaching activities.

II. METHOD

The acronym ADDIE stands for its five phases: Analyze, Design, Develop, Implement, and Evaluate. ADDIE is a concept for product development. The

ADDIE concept is used to build performance-based learning. The ADDIE application's educational philosophy is that deliberate learning should be student-centered, inventive, authentic, and inspiring. ADDIE is excellent for designing educational products and other learning materials because it is essentially a method that acts as a guiding framework for complex situations (Branch, 2009).

This research was conducted in 3 elementary schools in Padang City, including SDN 06 Kp Lapai, SDN 10 Lambung Bukit, and SDN 49 Kuranji, involving 1 class in each school with a total of 79 students overall. 6 students from each school among the total students were selected to be participants in the small group testing.

Data on validity and practicality were collected using questionnaires. There were 5 validators who validated 3 aspects of the media: media, content, and language. The practicality questionnaire was filled out by students and teachers after the media was tested in teaching at the school. Data from the validity and practicality questionnaires were then analyzed quantitatively. The results of the analysis are presented in the form of statistical data. The validity and practicality categories can be seen in Tables 1 and 2.

Table 1.
Categories of Learning Media Validity

Percentages	Categories
86 - 100	Highly Valid
78 - 85	Valid
60 - 75	Satisfactorily Valid
55 - 59	Not Valid
00 - 54	Highly Not Valid

Table 2.
Categories of Learning Media Practicality

Percentages	Categories
90 - 100	Highly Practical
80 - 89	Practical
65 - 79	Satisfactorily Practical
55 - 64	Less Practical
0 - 54	Not Practical

III. RESULT AND DISCUSSION

This study was conducted to develop an interactive learning media product based on RME that is valid and practical for use in elementary school learning according to the Merdeka Curriculum. In order to achieve this, the media was validated by experts, revised, and tested with students in the classroom.

A. Analysis

The analysis is carried out in four stages, which include needs analysis, curriculum analysis, content analysis, and student analysis. Here are the details of these four stages:

Firstly, a needs analysis is conducted through preliminary study observations using observation sheets, interviews with classroom teachers and students in three elementary schools in Padang, as well as gathering information from various sources such as books, journals, expert opinions, and others. The result is the need for media that can support learning in addition to textbooks and worksheets, aid students' understanding of plane geometry materials, and alleviate boredom while boosting students' enthusiasm for learning in the classroom.

Secondly, curriculum analysis is conducted by reviewing the Merdeka Curriculum. The developed media aligns with the Mathematics Learning Outcomes (CP) in Phase C of Merdeka Curriculum, focusing on the determination of the

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perimeter and area of various plane geometry (triangles, quadrilaterals, and polygons) and their combinations.

Thirdly, material analysis is conducted to ensure the alignment of the developed media with the content being taught. The content within the media covers topics related to geometry, including the characteristics, perimeter, and area of plane geometry such as squares, rectangles, and triangles.

Fourthly, student analysis is carried out to assess the students' abilities and interests. Based on the questionnaires filled out by the students, 97% of them enjoyed learning with the media, and 100% liked technology-based electronic learning media.

B. Design

We compile resources and prepare a reference structure for the media components to be generated at this stage. The design phase begins with the creation of a storyboard, which serves as a framework for the whole product development process.

The interactive learning media was created using Microsoft PowerPoint, based on the storyboard guidelines. The media is made up of multiple slides, which include the author's profile, user instructions, learning objectives, learning goals, learning indicators, learning options, content delivery, exercises, exercise solution pages, and the final menu.

C. Development

During the development phase, a validation test was conducted by five experts, focusing on three aspects: the media, content, and language. Here are the details of each aspect that was validated:

First, the validation of the media aspect was carried out by Prof Dr. Rakimahwati, M.Pd, Dr. Adrias, S.Pd, M.Pd, Dr. Rayendra, S.Pd, M.Pd, and Arespi Junindra, M.Pd. The validation results can be seen in Table 3.

Table 3.
Results of Media Aspect Validation

Aspects	Percentages
Creativity	100
Effectiveness	100
User Instructions	93,8
Tools	92,2
Appearance and Layout	92,5
Images and Sounds	93,8
Average Score	94,2
Criteria	Highly Valid

Second, the validation of the content aspect was conducted by Drs Syafri Ahmad, M.Pd, Ph.D, Prof Dr. Rakimahwati, M.Pd, Dr. Adrias, S.Pd, M.Pd, and Arespi Junindra, M.Pd. The validation results can be seen in Table 4.

Table 4.
Results of Content Aspect Validation

Aspects	Percentage
Conformity with Curriculum	97,9
Accuracy	92,7
Currency	95,3
Encouraging Curiosity	96,9
Average Score	94,8
Criteria	Highly Valid

Third, the validation of the language aspect was performed by Prof Dr. Rakimahwati, M.Pd, Dr. Adrias, S.Pd, M.Pd, and Arespi Junindra, M.Pd. The validation results are presented in Table 5.

Table 5.
Results of Language Aspect Validation

Aspects	Percentage
Suitability	95,8

Selection	97,2
Clarity	100
Average Score	97,2
Criteria	Highly Valid

The validation results for the three created media aspects are 95.4% on average. As a result, the developed media is highly valid for use in school learning activities. This means that the developed media can be tested after small adjustments, depending on the suggestions of the validators. Table 6 displays the validators' feedback. Figures 1 and 2 show examples of interactive learning media based on RME interfaces that have been validated and are ready for field testing.

Table 6.
Validator's Feedback

Aspects	Percentage
Images and Sounds	Synchronize sound with text

Figure 1. The Media Presents Content about Triangle

Figure 2. The Media Presents Content about Rectangle

D. Implementation

Validated interactive learning media based on RME was then examined for its applicability in school learning. The testing was conducted in two stages at 3 elementary schools: small group testing and large group testing. Six students from each school participated in small group testing. Table 7 shows the average results of the three schools' small group testing.

Table 7.
The Average Practicality Testing Results of The Small Group Testing

Aspects	Percentage
Presentation	91,7
Usage	89,4
Average Score	90,5
Criteria	Highly Practical

The average practicality results of the small group trials in the three schools show that the interactive learning media based on RME media fall into 'highly practical' criteria. Therefore, large group testing can be conducted without the need for any revisions beforehand. Large group testing was attended by one class in each school, with a total of 79 students. The average practicality results of the large group testing in the 3 schools based on student questionnaires can be seen in Table 8.

Table 8.
The Average Practicality Testing Results of The Large Group Testing Based on Student Questionnaires

Aspects	Percentage
Presentation	92,1
Usage	90
Average Score	91
Criteria	Highly Practical

The results of the large group testing in the three schools based on student questionnaires show that the interactive learning media based on RME received an average score of 91% and falls within the 'highly practical' criteria. As a complement, the practicality scores of the large group testing in the 3 schools were also obtained

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based on teacher questionnaires. The results can be seen in Table 9.

Table 9.
The Average Practicality Testing Results of The Large Group Testing Based on Teacher Questionnaires

Aspects	Percentage
Usage	91,7
Content	97,9
Technical Design	95
Communication	100
Packaging Format	97,2
Average Score	95,5
Criteria	Highly Practical

The results of the large group testing in the 3 schools based on teacher questionnaires show that the interactive learning media based on RME received an average score of 95.5% and falls within the 'Highly Practical' criteria. When the average practicality scores based on student and teacher questionnaires are combined, the overall average score is 93.3%. Therefore, it can be concluded that the interactive learning media based on RME we developed is highly practical for use in classroom learning activities.

E. Evaluation

An evaluation was conducted at each stage of product development, including the analysis, design, and development stages. The development and testing process has successfully produced a valid and practical interactive learning media based on RME product. Therefore, the media we have developed is ready for use in classroom learning activities.

The validity and practicality of the media we developed are in line with other interactive learning media on plane geometry that have been previously developed, such as the works of Amelia et al (2023) based on Canva and Artika et al (2023) based on Adobe Flash. The validity and practicality of the media we developed are also in line with other RME-based media developed by previous researchers, such as the RME-based scrapbook media by Nuzula et al (2023) and the RME-based PowerPoint presentation media by Dewi and Izzati (2020)

When used in classroom learning, interactive learning media significantly influence learning outcomes, motivation, and critical thinking abilities (Husna & Hasanah, 2023; Sulistyaningsih et al., 2023). As for the RME approach, its significant impact has been tested in instilling concepts related to plane geometry, eliminating misconceptions about plane geometry, improving learning outcomes, and improving students' critical thinking abilities. (Afriansyah, 2022; Pawira, 2009; Pramita, 2018; Rizma Vira et al., 2019; Silvia et al., 2022).

Considering that the media we have developed is a combination of interactive learning media and the RME approach, we certainly hope that all the positive effects of both are encompassed within it. However, taking into account time constraints and available resources, effectiveness tests to prove the impacts of the media we have developed will be conducted in future research.

IV. CONCLUSION

The interactive learning media based on RME for Merdeka Curriculum that we have developed using the ADDIE procedure method have proven to be highly valid and

highly practical for use in elementary schools. Its validity covers three aspects, including media, content, and language. Its practicality encompasses six aspects, including presentation, usage, content, technical design, communication, and packaging format.

This product still has room for further research, such as testing its effectiveness in education. In addition, adding other potential features like gamification, educational songs for children, and physical activity-based assignments can also be considered for future development.

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