JURNAL ABSIS
Jurnal Pendidikan Matematika dan Matematika
Vol. 8 No. 1, April 2025

DEVELOPMENT OF TEACHING MATERIALS BASED ON REALISTIC MATHEMATICS EDUCATION TO FACILITATE STUDENTS' MATHEMATICAL CRITICAL THINKING SKILLS

Ranty Andika Abinaya Zameza[1], *Maimunah[2], Nahor Murani Hutapea[3]
[1,2,3] Universitas Riau, Indonesia
maimunah@lecturer.unri.ac.id

ABSTRACT This study aims to develop mathematics teaching material based on the Realistic Mathematics Education (RME) approach that is valid and practical to facilitate the mathematical critical thinking skills of eighth-grade junior high school students. The research was motivated by the low level of students' critical thinking skills and the lack of teaching materials that support their development. This research employed a development method using the 4D model, which includes the stages of define, design, develop, and disseminate. The limited trial involved 17 eighth-grade students at SMP Negeri 2 in the Suliki subdistrict. The instruments used included expert validation sheets and student response questionnaires. The results showed that the teaching material obtained a validity score of 85.05% (valid category) and a practicality score of 87.38% (very practical category). Analysis of students' written work also showed that the material effectively facilitated critical thinking indicators such as interpretation, analysis, and inference. Therefore, the developed teaching material is recommended for use in mathematics instruction for eighth-grade students.

Keywords: teaching material, Realistic Mathematics Education, mathematical critical thinking, development

ABSTRAK Penelitian ini bertujuan untuk mengembangkan bahan ajar matematika berbasis Realistic Mathematics Education (RME) yang valid dan praktis untuk memfasilitasi kemampuan berpikir kritis matematis siswa kelas VIII SMP. Latar belakang penelitian ini adalah rendahnya kemampuan berpikir kritis siswa serta kurangnya bahan ajar yang mendukung pengembangan kemampuan tersebut. Penelitian ini merupakan penelitian pengembangan dengan model 4D yang mencakup tahapan define, design, develop, dan disseminate. Subjek uji coba terbatas melibatkan 17 siswa kelas VIII SMP Negeri 2 Kecamatan Suliki. Instrumen yang digunakan berupa lembar validasi oleh ahli dan angket respon siswa. Hasil penelitian menunjukkan bahan ajar memiliki skor validitas sebesar 85,05% (kategori valid) dan skor praktikalitas sebesar 87,38% (kategori sangat praktis). Analisis jawaban siswa juga menunjukkan bahwa bahan ajar mampu memfasilitasi indikator berpikir kritis, yaitu interpretasi, analisis, dan inferensi. Oleh karena itu, bahan ajar ini direkomendasikan untuk digunakan dalam pembelajaran matematika di kelas VIII SMP.

Kata-kata kunci: bahan ajar, RME, berpikir kritis matematis, pengembangan

INTRODUCTION

Mathematics is one of the essential components in education. As an exact science, mathematics continues to evolve in line with human thinking, activities, and life itself (Abror, 2022). One of the objectives of mathematics education in schools is to equip students with critical thinking skills (Cahyaningsih & Nahdi, 2020). Mathematical critical thinking is defined as the ability to think scientifically within the scope of mathematics through the processes of understanding, analyzing, evaluating information, and drawing accurate conclusions (Kusumawardani et al., 2022). According to Wahyuni et al. (2017), this ability is essential for students to develop their knowledge and concepts to solve problems. Therefore, students who possess critical thinking skills are able to select the best alternatives and act rationally (Fitriarosah, 2023). Thus, mathematical critical thinking must be fostered and developed so that mathematics learning in schools becomes meaningful (Yanti & Prahmana, 2017).

However, various studies have shown that Indonesian students' mathematical critical thinking skills remain low. The results of the 2015 Trends in International Mathematics and Science Study (TIMSS) revealed that Indonesia scored 397, ranking 44th out of 49 participating countries (Zulfikar, 2015). This low achievement reflects weak critical thinking skills, considering that TIMSS questions require a strong ability to think critically (Martyanti & Suhartini, 2018). A study conducted by Agustin and Effendi (2022) found that 80.55% of students had mathematical critical thinking skills in the very low category, while Agus and Purnama (2022) reported a figure of 94.4% in the same category. More specifically, only 30.2% of students could complete problems related to interpretation, 20.1% in analysis, 20.1% in evaluation, and merely 1.7% in conclusion.

Cahyaningsih and Nahdi (2020) argue that students' low critical thinking ability reflects shortcomings in the design of mathematics instruction by teachers. Therefore, efforts to improve critical thinking skills through appropriate mathematics learning approaches are urgently needed (Martyanti & Suhartini, 2018). One such effort is the use of teaching materials that specifically aim to develop students' critical thinking skills (Cahyaningsih & Nahdi, 2020). Teaching materials are systematically arranged content designed to assist teachers in the teaching and learning process and to provide students with a clear understanding of the competencies they are expected to achieve (Dafit & Mustika, 2021). In addition, teaching materials serve as a source of motivation, particularly when presented in a contextual and meaningful way (Choiriyah et al., 2022). Nuraeni et al. (2022) further emphasize that developing instructional materials is essential for ensuring that learning remains efficient, effective, and aligned with targeted learning competencies.

https://doi.org/10.30606/absis.v8i1.2683

To make mathematics learning more contextual and meaningful, teaching materials should be closely related to students' real-life experiences and derived from problems found in their surroundings. This approach helps students better understand abstract mathematical concepts and enhances their mathematical thinking skills (Wahyuni & Efuansyah, 2018). One relevant approach is Realistic Mathematics Education (RME) (Yanti et al., 2023). This approach is believed to support the development of students' mathematical critical thinking skills (Delina et al., 2018). According to Khoirunnisa and Amidi (2022), RME emphasizes presenting real-life contextual problems to help students explore ideas, solve problems, and actively engage in mathematical thinking. Choosing the appropriate model or instructional approach is an important step in enhancing students' critical thinking skills (Cahyaningsih & Nahdi, 2020). One topic that is highly suitable for this purpose is relations and functions. Research by Endrawati and Aini (2022) shows that students' critical thinking skills remain low in this topic, while Anastasia and Christanti (2020) report that students still struggle to distinguish between relations and functions.

Previous studies have focused on the development of RME-based teaching materials in various mathematics topics, such as fractions (Halimah, 2021) and three-dimensional geometry (Fitria, 2020). However, few studies have specifically developed RME-based instructional materials to support the improvement of students' mathematical critical thinking skills on the topic of relations and functions in Grade VIII of junior high school. Therefore, this study aims to develop teaching materials based on Realistic Mathematics Education to facilitate the improvement of mathematical critical thinking skills among eighth-grade junior high school students.

METHODS

This study is a research and development (R&D) project using the 4D model. According to Kosassy (2019), this model consists of four main stages: define, design, develop, and disseminate. The first stage, define, aims to collect and analyze information regarding the urgency of developing teaching materials. This stage involves four types of analysis: preliminary-final analysis to identify core problems in the learning process as the foundation for development; student analysis to identify learner characteristics; concept analysis to systematically organize the subject matter; task analysis to identify core competencies that students must master; and formulation of learning objectives. This stage produces the first prototype (Prototype 1).

The second stage, design, aims to produce the blueprint of the teaching materials. This includes preparing standard test instruments (validation and practicality instruments), selecting media and formats, and drafting the initial teaching material based on the chosen format.

The third stage, development, aims to refine the teaching material based on feedback from validators and students' readability responses. In this stage, Prototype 1 is developed into Prototype 2 through two main processes: expert review and developmental testing.

The final stage, dissemination, consists of packaging and distributing the developed teaching material. The final product is disseminated in printed form.

The participants in this study were 17 students from SMP Negeri 2 Suliki Subdistrict, representing diverse academic abilities. Both quantitative and qualitative data were collected. Quantitative data were obtained from validators through validation questionnaires and from student responses through practicality questionnaires. Qualitative data were collected from feedback given by validators and students after using the developed teaching materials.

Validation data were analyzed using the following formula:

$$\bar{V}_a = \frac{\sum_{i=1}^{n} V_{ai}}{n} \times 100\%$$

Where $\bar{V}_a$ represents the average validation score, V_{ai} is the score from each validator, and n is the number of validators (Akbar, 2013). The criteria for validity are shown in Table 1.

Table 1. Teaching Material Validation Criteria (Akbar, 2013)

Interval	Level of Validity
85.01%–100%	Very Valid
70.01%–85%	Valid
50.01%–70%	Less Valid
1.00%–50%	Not Valid

The practicality score was derived from student response questionnaires and calculated using the formula:

$$\bar{V}_p = \frac{\sum_{i=1}^{n} V_{pi}}{n}$$

Where $\overline{V_p}$ is the average practicality score, V_{p_i} is the practicality score for each item, and nnn is the number of student respondents (Akbar, 2013). The results were interpreted based on the criteria in Table 2.

https://doi.org/10.30606/absis.v8i1.2683

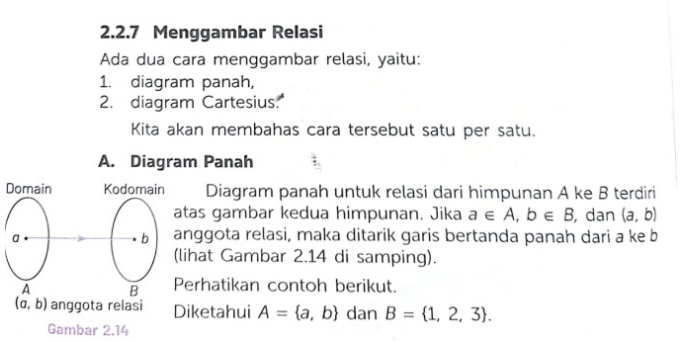
Table 2. Teaching Material Practicality Criteria (Akbar, 2013)

Interval	Level of Validity
85.01%–100%	Very Practical
70.01%–85%	Practical
50.01%–70%	Less Practical
1%–50%	Not Practical

FINDING AND DISCUSSION

Define Stage

In the define stage, a series of analyses was conducted to identify the needs and direction for developing the teaching material. The initial analysis was carried out through interviews with a mathematics teacher at SMP Negeri 2 in the Suliki subdistrict. The interview results revealed that the curriculum implemented at the school is the Merdeka Curriculum. The dominant instructional method used by the teacher is lecture-based, which leads to teacher-centered learning. Furthermore, the eighth-grade mathematics textbook used as the primary learning resource is still considered lacking in contextual problem presentation and does not adequately address aspects related to students' mathematical critical thinking skills, which are essential for 21st-century learning.



2.2.7 Menggambar Relasi

Ada dua cara menggambar relasi, yaitu:
1. diagram panah,
2. diagram Cartesius.

Kita akan membahas cara tersebut satu per satu.

A. Diagram Panah

Domain Kodomain

Diagram panah untuk relasi dari himpunan A ke B terdiri atas gambar kedua himpunan. Jika $a \in A$, $b \in B$, dan (a, b) anggota relasi, maka ditarik garis bertanda panah dari a ke b (lihat Gambar 2.14 di samping).

Perhatikan contoh berikut.

Diketahui $A = \{a, b\}$ dan $B = \{1, 2, 3\}$.

A B
(a, b) anggota relasi

Gambar 2.14

Figure 1. Student Textbook

Based on the analysis of student characteristics, the learners were found to be in the 12–14 age range, which corresponds to the transitional stage from concrete operational to formal operational cognitive development, according to Piaget's theory. At this stage, students are generally capable of performing mathematical calculations, thinking creatively, using abstract reasoning, and imagining the outcomes of specific actions. Nevertheless, some students still struggle to grasp abstract ideas if they are not first introduced through concrete representations or experiences. Therefore, mathematics instruction should begin with contextual or concrete illustrations to help students construct their own understanding. This

implies that the developed teaching material must be designed in such a way that it supports students in visualizing and making sense of mathematical concepts and processes.

The conceptual analysis resulted in four main topics that served as the foundation for the teaching material: relations, functions, the number of mappings, and function values. These concepts were structured based on the 2022 edition of the Erlangga mathematics textbook and adjusted to fit the eighth-grade learning level.

To ensure the alignment of the teaching material with the curriculum goals, an analysis of the learning outcomes was conducted, referring to the national educational guidelines issued by the Ministry of Education. The outcomes of this analysis were then used to develop a systematically organized and coherent learning objective flow.

Based on the results of the conceptual and task analyses, the learning objectives were formulated. The teaching material was designed to be implemented over four meetings, each of which includes clear learning goals that aim to foster students' mathematical critical thinking skills.

Design Stage

The design stage aimed to analyze and construct the development of the teaching material. The first step in this stage was the preparation of standard instruments, which consisted of a validation instrument to assess the validity level of the teaching material by experts, and a practicality instrument to measure the level of practicality as perceived by students. The validation instrument was in the form of a validation sheet, comprising six assessment components: graphic aspects, language aspects, presentation aspects, content aspects, Realistic Mathematics Education aspects, and mathematical critical thinking skills aspects, adapted from Sastrawan Made (2014). Meanwhile, the practicality instrument used was a student response questionnaire consisting of four assessment components: display aspects, content aspects, and language aspects, adapted from Maimunah et al. (2023).

Following the preparation of the instruments, the next step was the selection of media or software for designing the teaching material. The application Canva was chosen for this purpose, and the final teaching material was intended to be printed in book form.

Subsequently, the design format of the teaching material was determined. The design included several components, such as designing the cover of the teaching material containing the name of the researcher, the names of the supervising lecturers, the title of the teaching material, supporting images, the class level, and the educational institution. In addition, the design included compiling the table of contents, drafting the description of the teaching material, preparing user guidelines, developing a learning objective flow, creating a concept map, organizing the main content into four units, writing summaries of the topics on relations and functions, preparing mathematical critical thinking skill tests, compiling a glossary,

https://doi.org/10.30606/absis.v8i1.2683

writing alternative answers, compiling a list of references, and drafting the author's profile.

The teaching material was designed according to the predetermined components. The content was organized into four units, namely Unit 1: Relations, Unit 2: Functions, Unit 3: Number of Mappings, and Unit 4: Function Values. Each unit contained specific learning objectives, an introduction to the material, learning activities structured according to the steps of the Realistic Mathematics Education approach, example problems, and critical thinking skill assessments.

The learning activities using the Realistic Mathematics Education approach were described systematically. Each learning activity began with understanding a contextual situation derived from real-life problems related to the topic being studied. In this stage, students were expected to understand the contextual problem and identify what information was known and what was being asked, thereby training students' critical thinking skills through the interpretation indicator. Following this, students were guided to gather relevant learning information. The collected information was then processed and analyzed to create a model that could provide a solution to the given problem, thus fostering the critical thinking skill associated with analysis. Finally, in the connection step, students were encouraged to link the newly acquired knowledge with their existing knowledge, allowing them to restate the concept or draw conclusions, thereby enhancing their critical thinking skill in making inferences.

Develop Stage

The teaching material that had been drafted was first reviewed with the supervising lecturer and then validated by expert validators. The expert validation was conducted by two university lecturers and one mathematics teacher. The validation process aimed to assess the quality of the material based on six criteria: graphic design, language, presentation, content, Realistic Mathematics Education components, and mathematical critical thinking skills. The feedback obtained from the validators was used to revise and improve the teaching material. The results of the validation process are presented in Table 3.

Table 3. Validation Results by Validators

Teaching Material Unit	Average Score from 3 Validators
Unit 1	82.84%
Unit 2	86.27%
Unit 3	85.78%
Unit 4	85.29%
Overall Average	**85.05%**
Category	**Valid**

According to Sari et al. (2019), mathematics teaching materials are considered valid if the validation score obtained from expert evaluation sheets is greater than or equal to 70.01%. As shown in Table 3, the average score assigned by the three validators was 85.05%, which classifies the material as valid. This confirms that the Realistic Mathematics Education-based teaching material meets the necessary validity standards.

Following the expert validation, an individual readability evaluation was conducted to assess how easily the material could be understood by students. This involved three students from SMP Negeri 2 in the Suliki subdistrict, each representing a different level of mathematical ability. The students were asked to study the material independently and report any parts that were difficult to comprehend. Their feedback included unclear terminology and vague instructional language, which were then used to make small but meaningful revisions.

In general, students expressed enthusiasm about using the teaching material. They found the design engaging, the instructions clear and easy to follow, and the content helpful in understanding the topics of relations and functions. This observation is consistent with the study by Akhmadi et al. (2022), which found that well-structured instructional materials increase student motivation and ease of use.

After completing the expert validation and individual readability test, a revised version (Prototype 2) was produced and tested with a small group of students to evaluate the practicality of the material. This trial involved 17 students from the same school. After working through the material, students were asked to present their results, solve the example problems, and complete the included critical thinking tasks. They then completed a student response questionnaire to provide feedback. The results are summarized in Table 4.

Table 4. Practicality Results of the Teaching Material

Teaching Material Unit	Average Practicality Score
Unit 1	88.9%
Unit 2	87.6%
Unit 3	86.7%
Unit 4	86.3%
Overall Average	**87.38%**
Category	**Very Practical**

The students' responses indicated that the teaching material helped them understand the topic of relations and functions more effectively because it was based on real-life contexts, contained accessible examples, and included practice problems to reinforce understanding. They also noted that the cover design was

https://doi.org/10.30606/absis.v8i1.2683

attractive and motivating, encouraging them to study the content independently. These results align with the findings of Hersandi et al. (2017), who found that the visual appeal of teaching materials can influence students' reading motivation and willingness to engage in learning.

For example, in one student's written work, shown in Figure 2, the student demonstrated their ability to interpret contextual problems. The response shows how the student was able to clearly identify what was known and what was asked in the problem, an important component of critical thinking.

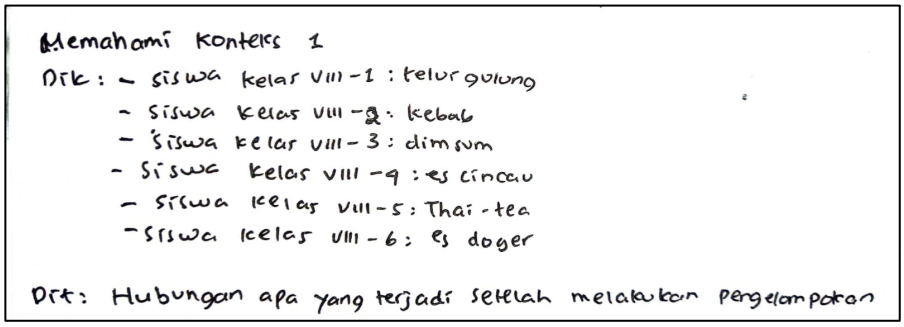


Figure 2. Student Response on Interpreting the Context

In the next stage, shown in Figure 3, the student successfully analyzed the information and constructed a model to represent the mathematical relationship described in the problem. This step reflects the student's critical thinking in analyzing data and formulating a solution path based on the given context.

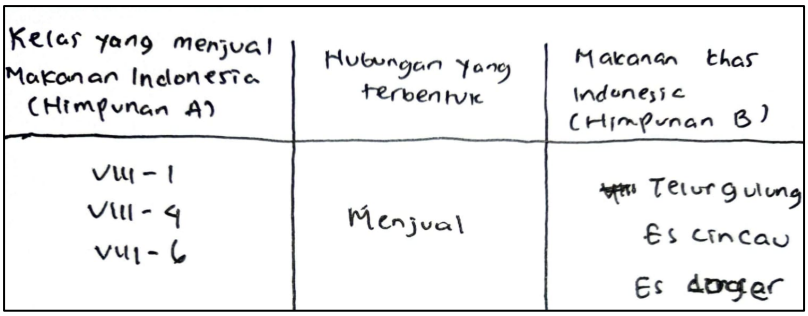


Figure 3. Student Response on Model Construction Step

Finally, in Figure 4, the student connected prior knowledge and reasoning to make an inference and draw a conclusion from the constructed model. This demonstrates the ability to generalize a concept and articulate findings, fulfilling the final indicator of critical thinking skills.

These examples confirm that the teaching material supported students' development of interpretation, analysis, and inference abilities. Additionally, students commented that the language and sentence structure in the material were simple and easy to understand. This confirms that the material possesses user-friendly characteristics, as the instructions and content were both clear and accessible. They also noted that the material helped them retain information and

facilitated independent learning without difficulties, indicating that the material was adaptive.

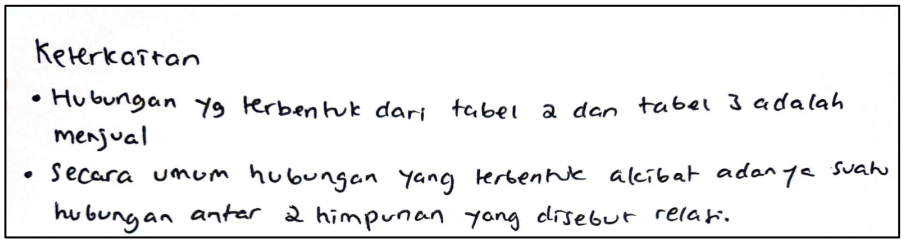


Figure 4. Student Response on Connection Step

The clarity of the instructional guides also enabled students to engage fully in the learning activities, showing that the material functioned as a stand-alone resource without requiring supplementary materials. Moreover, since the content was presented sequentially and comprehensively, the material fulfilled the criterion of being self-contained, containing all the necessary content related to relations and functions within a single volume.

These findings are consistent with studies by Magdalena et al. (2020) and Maimunah et al. (2023), which define quality teaching materials as those that are self-instructional, user-friendly, adaptive, stand-alone, and self-contained. With a practicality score of 87.38%, the Realistic Mathematics Education-based teaching material developed in this study is confirmed to be highly practical. Based on the validation and small group trial results, it can be concluded that the material is both valid and practical, making it suitable for classroom implementation.

This conclusion is further supported by studies conducted by Cahyaningsih and Nahdi (2020), and Maimunah et al. (2023), which found that the use of Realistic Mathematics Education-based teaching materials resulted in improved mathematical critical thinking skills compared to conventional lecture methods. Furthermore, these findings align with Delina et al. (2018), who argued that the Realistic Mathematics Education approach is particularly effective in fostering students' ability to think critically in mathematics. This was evident in how students responded accurately and thoughtfully to the tasks in the material.

Disseminate Stage

Following the validation and practicality testing phases, the developed teaching material was confirmed to be both valid and highly practical. These results indicated that the teaching material meets the necessary criteria for use by teachers and students. Therefore, the material was deemed suitable for broader implementation in mathematics learning activities.

At this stage, the teaching material was prepared for packaging and dissemination. The packaging process involved refining the design, completing the final editing, and preparing the teaching material in book form to ensure its ease of use and durability in the classroom setting. The finalized version of the teaching material includes all

https://doi.org/10.30606/absis.v8i1.2683

key components developed during the design phase, such as a structured sequence of learning units, contextual problem-solving activities, and critical thinking exercises aligned with the Realistic Mathematics Education approach.

In addition to internal dissemination within the research site, the teaching material is intended to be shared more widely through online platforms and direct distribution to SMP Negeri 2 in the Suliki subdistrict. This ensures that the teaching material can be accessed not only by the immediate research participants but also by other educators seeking innovative resources to support mathematical critical thinking skills development.

The cover design of the teaching material was also finalized at this stage. The cover is designed to be visually engaging and reflective of the Realistic Mathematics Education principles, providing an attractive and professional appearance to capture students' interest and motivation to engage with the material.

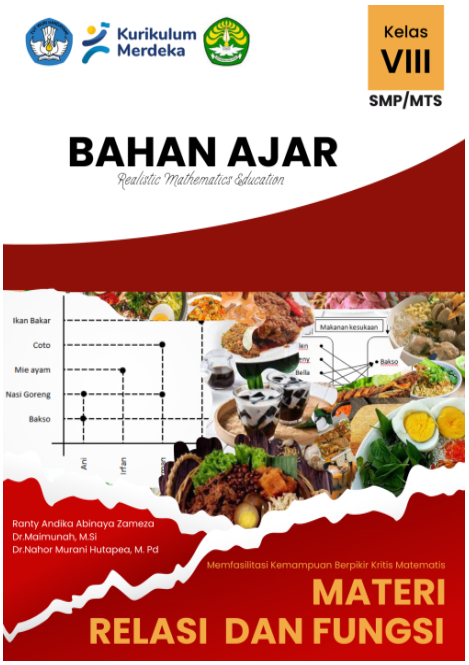


Figure 5. Cover of the Developed Teaching Material

Through the packaging and dissemination process, the teaching material is expected to contribute to enhancing students' critical thinking skills in mathematics by offering structured, contextual, and student-centered learning experiences. This dissemination phase marks the culmination of the development process, transitioning the teaching material from research output to practical educational tool ready for classroom application.

CONCLUSIONS AND RECOMMENDATIONS

The final product of this study is a mathematics teaching material based on the Realistic Mathematics Education approach that meets the criteria of validity and

practicality for use by eighth-grade junior high school students. This teaching material was found to effectively facilitate students' mathematical critical thinking skills, as evidenced by the students' written responses during the completion of the material. The validation results show that the material achieved an average expert validation score of 84.96%, placing it in the valid category. Furthermore, the practicality assessment yielded an average score of 87.36%, indicating that the material is highly practical for classroom use.

Based on these results, it can be concluded that the developed teaching material is appropriate for supporting the development of students' critical thinking skills in mathematics and is ready to be used in classroom learning.

This study was limited to small group testing; therefore, future researchers are encouraged to expand the testing to a larger group to examine the effectiveness of the material in a broader learning context. Further research may also explore the development of similar teaching materials at different educational levels or in different subject areas, utilizing the Realistic Mathematics Education approach or other innovative instructional methods.

REFERENCES

Abror, M. H. (2022). Self-regulated learning terhadap hasil belajar matematika siswa. *Plusminus: Jurnal Pendidikan Matematika, 2*(2), 233–242. https://doi.org/10.31980/plusminus.v2i2.1676

Agus, I., & Purnama, A. N. (2022). Kemampuan berpikir kritis matematika siswa: Studi pada siswa SMPN Satu Atap. *Jurnal Pendidikan Matematika Raflesia, 7*(1), 65–74. https://ejournal.unib.ac.id/index.php/jpmr

Agustin, Y., & Effendi, K. N. S. (2022). Analisis kemampuan berpikir kritis matematis siswa SMP pada materi SPLDV. *Transformasi: Jurnal Pendidikan Matematika dan Matematika, 6*(2), 121–132. https://doi.org/10.36526/tr.v6i2.2222

Akbar. (2013). *Instrumen perangkat pembelajaran*. PT Remaja Rosdakarya.

Akhmadi, M. N., Rufi'i, R., & Hartono, H. (2022). Pengembangan modul digital IPS materi menghargai peninggalan sejarah di lingkungan setempat. *JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika), 7*(2), 374–384. https://doi.org/10.29100/jipi.v7i2.2752

Anastasia, R. M., & Christanti, A. D. I. (2020). Analisis kesalahan siswa kelas VIII SMP Kanisius Gayam dalam menyelesaikan soal relasi dan fungsi. *Prosiding Seminar Nasional Pendidikan Matematika UNIKAL, 1*, 281–292.

Cahyaningsih, U., & Nahdi, D. S. (2020). Pengembangan bahan ajar matematika SD berbasis model pembelajaran Realistic Mathematics Education yang berorientasi kemampuan berpikir kritis. *Jurnal Educatio FKIP UNMA, 6*(2), 598–604. https://doi.org/10.31949/educatio.v6i2.622

https://doi.org/10.30606/absis.v8i1.2683

Choiriyah, C., Noviani, D., & Priyanti, Y. (2022). Pelatihan pembuatan bahan ajar pada guru SMA Bina Warga (BW) 2 Palembang. *AKM: Aksi Kepada Masyarakat, 3*(1), 161–170. https://doi.org/10.36908/akm.v3i1.448

Dafit, F., & Mustika, D. (2021). Pengembangan bahan ajar membaca berbasis Higher Order Thinking Skills pada siswa sekolah dasar. *Edukatif: Jurnal Ilmu Pendidikan, 3*(6), 4889–4903.

Delina, Afrilianto, M., & Rohaeti, E. E. (2018). Confidence siswa SMP melalui pendekatan Realistic Mathematics Education. *Jurnal Pembelajaran Matematika Inovatif, 1*(3), 281–288. https://doi.org/10.22460/jpmi.v1i3.281-288

Endrawati, P., & Aini, I. N. (2022). Deskripsi kemampuan berpikir kritis matematis dalam pembelajaran relasi dan fungsi. *Jurnal Penelitian dan Pembelajaran Matematika, 15*(1), 118. https://doi.org/10.30870/jppm.v15i1.14112

Fitria, D. (2020). *Pengembangan modul pembelajaran berbasis pendekatan Realistic Mathematic Education (RME) untuk meningkatkan pemahaman konsep matematika pada materi bangun ruang sisi datar di kelas VIII MTs*. YPP AZIDDIN Medan.

Fitriarosah, N. (2023). Peningkatan kemampuan berpikir kritis dan kreatif matematis siswa SMP melalui pembelajaran berbasis masalah. *Kinanti: Jurnal Karya Insan Pendidikan Terpilih, 1*(1), 129–181. https://doi.org/10.62518/cyykw819

Halimah, S. (2021). *Pengembangan bahan ajar berbasis Realistic Mathematics Education (RME) pada pembelajaran matematika materi bentuk pecahan kelas 4 sekolah dasar*. Universitas Islam Negeri Syarif Hidayatullah Jakarta. https://repository.uinjkt.ac.id/dspace/handle/123456789/55942

Hersandi, M., Mahardika, I. K., & Nuriman. (2017). Pengembangan bahan ajar lembar kerja siswa (LKS) dalam bentuk brosur untuk pembelajaran IPA di SMP ditinjau dari aspek kegrafikaannya. *Jurnal Pembelajaran dan Pendidikan Sains, 2*(1), 57–64.

Khoirunnisa, K., & Amidi. (2022). Pengembangan bahan ajar berbasis outdoor learning dengan model Connected Mathematics Project (CMP) dan pendekatan saintifik. *Prisma: Prosiding Seminar Nasional Matematika, 5*, 559–564.

Kosassy, S. O. (2019). Mengulas model-model pengembangan pembelajaran dan perangkat pembelajaran. *Jurnal Pelita Bangsa Pelestari Pancasila, 14*(1), 152–173. https://e-journal.my.id/proximal/article/view/211

Kusumawardani, N. N., Rusijono, R., & Dewi, U. (2022). Pengaruh model Problem Based Learning terhadap kemampuan berpikir kritis matematis siswa. *Jurnal Ilmiah Mandala Education, 8*(2), 1416–1427. https://doi.org/10.58258/jime.v8i2.3217

Magdalena, I., Prabandani, R. O., Rini, E. S., Fitriani, M. A., & Putri, A. A. (2020). Analisis pengembangan bahan ajar. *Jurnal Nusantara, 2*(2), 170–187. https://ejournal.stitpn.ac.id/index.php/nusantara/article/view/805

Maimunah, M., Fitri, W. J., & Suanto, E. (2023). Modul berbasis Realistic Mathematics Education berbantuan QR code untuk memfasilitasi kemampuan berpikir kritis siswa SMP. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 12*(2), 2048. https://doi.org/10.24127/ajpm.v12i2.6950

Martyanti, A., & Suhartini, S. (2018). Etnomatematika: Menumbuhkan kemampuan berpikir kritis melalui budaya dan matematika. *IndoMath: Indonesia Mathematics Education, 1*(1), 35. https://doi.org/10.30738/indomath.v1i1.2212

Nuraeni, I., Ratnaningsih, N., & Madawistama, S. T. (2022). Pengembangan bahan ajar interaktif melalui aplikasi iSpring untuk mengeksplor kemampuan representasi matematis. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 6*(1), 1008–1024. https://doi.org/10.31004/cendekia.v6i1.1179

Sari, N., Rezeki, S., & Ariawan, R. (2019). Materi himpunan terintegrasi keislaman: Sebuah studi pengembangan model Problem-Based Learning. *Jurnal Aksiomatik, 7*(3), 10–17.

Sastrawan Made, T. I. Made. (2014). Jurnal pendidikan matematika, 2(2), 39–49.

Wahyuni, M., Rahayu, W., & Widyati, R. (2017). Perbandingan kemampuan berpikir kritis matematis antara siswa yang belajar menggunakan model Problem Based Learning dan Reciprocal Teaching. *Jurnal Riset Pembelajaran Matematika Sekolah, 1*(1), 37–45. https://doi.org/10.21009/jrpms.011.05

Wahyuni, R., & Efuansyah, E. (2018). Model pembelajaran Missouri Mathematics Project menggunakan strategi Think Talk Write terhadap kemampuan berpikir kritis dan pemecahan masalah. *JNPM: Jurnal Nasional Pendidikan Matematika, 2*(1), 24. https://doi.org/10.33603/jnpm.v2i1.778

Yanti, O. F., & Prahmana, R. C. I. (2017). Model Problem Based Learning, Guided Inquiry, dan kemampuan berpikir kritis matematis. *Jurnal Review Pembelajaran Matematika, 2*(2), 120–130. https://doi.org/10.15642/jrpm.2017.2.2.120-130

Yanti, P. V., Harahap, M. S., & Siregar, E. Y. (2023). Pengembangan bahan ajar matematika berbasis pendekatan Realistic Mathematics Education untuk membangun kemampuan berpikir kritis siswa. *Mathematic Education Journal, 6*(2), 94–104. https://www.journal.ipts.ac.id/index.php/MathEdu/article/view/5279

Zulfikar, F. (2015). Kecemasan matematika dan kemampuan berpikir kritis matematis siswa di sekolah menengah pertama. *Jurnal Pendidikan Matematika, 4*(1), 59–72.

https://doi.org/10.30606/absis.v8i1.2683