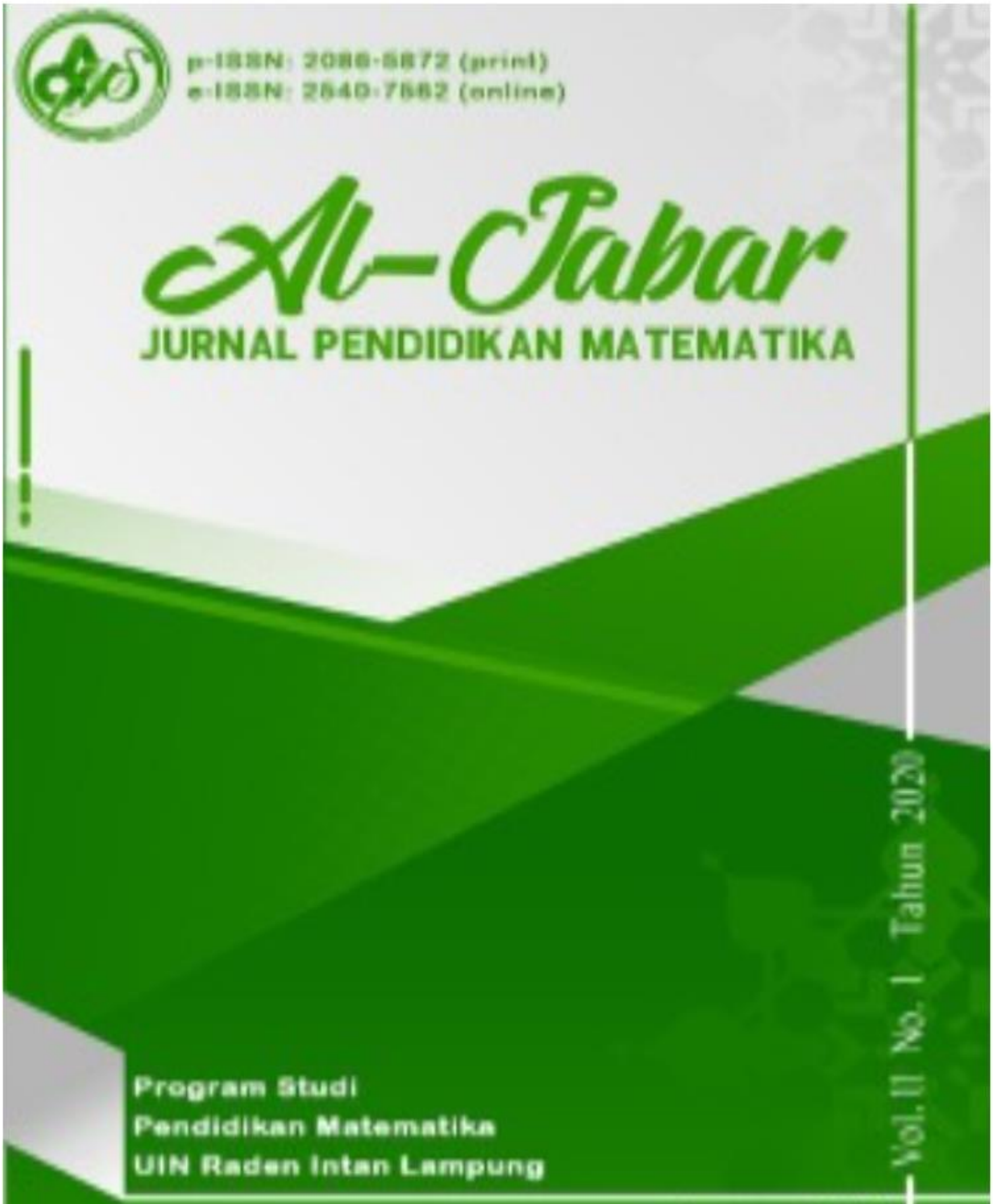
p-ISSN: 2086-5872 (print)
e-ISSN: 2540-7562 (online)
Al-Jabar
JURNAL PENDIDIKAN MATEMATIKA
Vol. II No. 1 Tahun 2020
Program Studi
Pendidikan Matematika
UIN Raden Intan Lampung

AL-JABAR: JURNAL PENDIDIKAN MATEMATIKA

PRODI PENDIDIKAN MATEMATIKA UIN RADEN INTAN LAMPUNG

P-ISSN : 20865872 E-ISSN : 25407562 Subject Area : Education

0
Impact

8145
Google Citations

Sinta 2
Current Acreditation

Google Scholar Garuda Website Editor URL

History Accreditation

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Editorial Team

Vol 15, No 2 (2024)

I-Jabar: Jurnal Pendidikan Matematika

All articles in this issue (15 articles) were authored/co-authored by 50 authors from 3 countries (Indonesia, Ghana, and Nigeria.

Table of Contents

Al-Jabar: Jurnal Pendidikan Matematika
Volume 15, Number 02, 2024, Pages 535 – 546
https: 10.24042/ajpm.v15i2.24560

Using the realistic mathematics education (RME) approach with scaffolding to enhance mathematical representation ability

Rizki Wahyu Yunian Putra, Sugeng Sutiarso, Nurhanurawati
Universitas Lampung, Indonesia
✉ rizkiwahyuyunianputra@radenintan.ac.id*

Article Information
Submitted Oct 11, 2024
Accepted Dec 02, 2024
Published Dec 12, 2024

Keywords
Learning Models;
Mathematical Representation;
Realistic Mathematics Education (RME);
Scaffolding.

Abstract

Background: Mathematical representation skills are essential for understanding and applying mathematical concepts. However, many students struggle to connect abstract concepts to real-life situations, making it difficult for them to improve their representation skills.
Aim: This study aims to develop and test the effectiveness of the Realistic Mathematics Education (RME) approach, supported by scaffolding, in improving students' mathematical representation skills.
Method: The study followed the ADDIE model, which includes five steps: Analysis, Design, Development, Implementation, and Evaluation. The participants were 50 second-semester students from classes A, C, and D in the Mathematics Education program at UIN Raden Intan Lampung.
Results: The development of the Realistic Mathematics Education (RME) model with scaffolding was validated by eight expert validators, confirming its validity and practicality. The model was designed to align with learning objectives, incorporate real-world contexts, and provide structured scaffolding tailored to students' needs. During implementation, the model demonstrated practicality as students actively engaged with learning activities and gradually developed independence in problem-solving. The effect size calculation of 0.9, categorized as high, confirmed the model's effectiveness in significantly enhancing students' mathematical representation skills.
Conclusion: The RME approach with scaffolding is an effective method to improve the quality of mathematics learning in higher education. It helps students better understand and apply mathematical concepts by linking them to practical problems.

INTRODUCTION

Mathematics plays a vital role in shaping students' logical, analytical, and critical thinking abilities, making it a fundamental discipline in both academics and everyday life. Research highlights that mathematical representation skills are critical for interpreting, presenting, and communicating mathematical ideas in forms such as graphs, symbols, and words (Hafriani, 2021). These skills are essential for students to understand and apply mathematical concepts in real-world contexts and across disciplines (Zuniar, 2020). Despite this importance, many students face difficulties in developing their representation skills, particularly at the higher education level, due to the abstract and complex nature of mathematical concepts (Nurdin, 2019; Qurohman et al., 2024). These

How to cite Putra, R. W. Y., Sutiarso, S., & Nurhanurawati, N. (2024). Using the realistic mathematics education (RME) approach with scaffolding to enhance mathematical representation ability. *Al-Jabar: Pendidikan Matematika*, *15*(2), 535-546.
E-ISSN 2540-7562
Published by Mathematics Education Department, UIN Raden Intan Lampung

challenges necessitate innovative teaching strategies to support students in enhancing their mathematical representation skills, setting the stage for exploring approaches like Realistic Mathematics Education (RME).

To address the challenges in developing mathematical representation skills, innovative approaches such as Realistic Mathematics Education (RME) have been proposed. RME emphasizes the use of real-world contexts to make abstract mathematical concepts more meaningful and relatable for students (Dhonna et al., 2024). Studies have demonstrated its effectiveness in improving mathematical literacy, problem-solving skills, and conceptual understanding (Kusumaningrum & Nuriadin, 2022; Nurhayanti et al., 2022). However, implementing RME in higher education remains challenging, particularly when addressing the diverse needs and varying levels of understanding among students (Retnodari et al., 2020). These limitations point to the need for complementary strategies, such as scaffolding, to maximize the effectiveness of RME in enhancing students' mathematical representation skills.

Scaffolding serves as a critical support mechanism to assist students in overcoming learning difficulties and achieving higher levels of understanding in mathematics. This approach aligns with Vygotsky's Zone of Proximal Development (ZPD), which defines the gap between what students can do independently and what they can achieve with guidance (Rahayu et al., 2020; Suardipa, 2020). Research has shown that scaffolding significantly improves students' abilities to represent mathematical concepts, particularly in complex tasks (Astutik, 2020). By providing structured and gradual support, scaffolding helps students transition from dependence to independence in learning (Retnodari et al., 2020). Integrating scaffolding into RME offers an opportunity to address these gaps, paving the way for a comprehensive approach that combines real-world relevance with effective support mechanisms.

The Realistic Mathematics Education (RME) approach has been widely applied to enhance various aspects of mathematics learning, including creative thinking (Goolla et al., 2024), mathematical literacy (Cahyo & Sutarni, 2023; Fauzana et al., 2020; Purwanti et al., 2019; Wesna et al., 2021), mathematical communication skills (Ahmad et al., 2023; Andriani & Fauzan, 2019; Ramadhani et al., 2023), and problem-solving abilities (Priciliya et al., 2022; Putri & Suparman, 2019). Furthermore, some studies have combined RME with technology, such as Google Classroom, to support learning (Wesna et al., 2021). However, studies that specifically focus on the impact of RME on students' mathematical representation skills remain very limited (Warsito et al., 2018). Meanwhile, scaffolding has been recognized as an effective strategy to assist students in completing complex tasks. Nevertheless, integrating scaffolding into RME to specifically enhance mathematical representation skills has not been extensively explored. Existing studies often focus on developing RME-based teaching tools without delving into the relationship between scaffolding and representation skills (Andison & Armiati, 2020). Therefore, this study aims to fill this gap by investigating how the combination of RME and scaffolding can be developed into a single learning unit and have a significant impact on improving students' mathematical representation skills, especially in the context of mathematics education in Indonesia.

METHODS

Design

This study employs the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model as the research design. The ADDIE model was chosen for its systematic structure and flexibility in developing learning tools (Winatha, 2018). The purpose of this study is to develop a Realistic Mathematics Education (RME) model supported by scaffolding to improve students' mathematical representation skills. Each phase of ADDIE has a specific role:

- Analysis: Identifying learning needs, particularly challenges students face in understanding abstract mathematical concepts.
- Design: Developing a learning model based on RME with real-world activities and scaffolding strategies.
- Development: Creating and validating the model with input from eight expert validators.
- Implementation: Applying the model to the research participants.
- Evaluation: Assessing the effectiveness of the model through formative and summative evaluations to determine its impact on students' mathematical representation skills.

The visual representation of the ADDIE model used in this study is shown below:

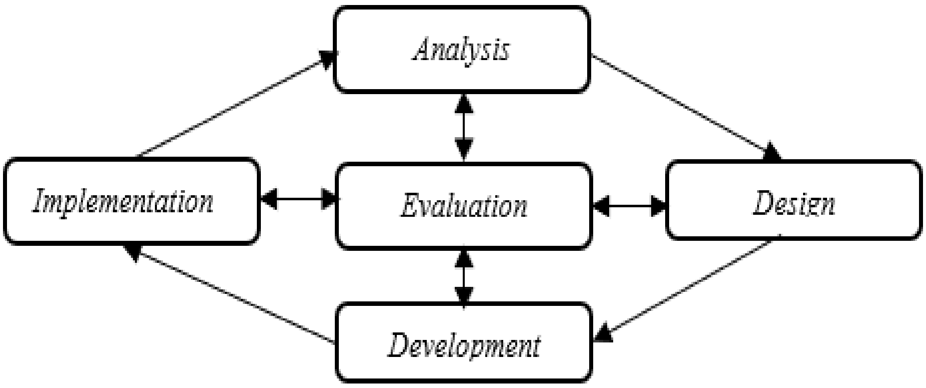

Figure 1. ADDIE Model Diagram

Participants

The participants of this study were second-semester students enrolled in the Mathematics Education program at UIN Raden Intan Lampung. A total of 50 students from three different classes (A, C, and D) were involved in the research. These participants were selected because they represented a diverse range of mathematical abilities, which aligned with the study's focus on addressing varied levels of understanding through scaffolding strategies. The students participated in the implementation of the developed learning model, allowing the researchers to evaluate its effectiveness in improving mathematical representation skills.

Instruments

The instruments used in this study include:

1. Mathematical Representation Skills Test: This test measures students' abilities in three aspects of representation:
    - Visual Representation: Using diagrams, graphs, or images.
    - Symbolic Representation: Creating equations or mathematical expressions.
    - Verbal Representation: Writing explanations or step-by-step solutions.

The indicators of mathematical representation skills are presented in the table below:

Table 1. Indicators of Mathematical Representation Skills

Aspect	Indicator
Visual Representation	Presenting data in diagrams, symbols, or graphs; Drawing patterns or geometric shapes.
Symbolic Representation	Creating mathematical equations; Solving problems using mathematical expressions.
Verbal Representation	Writing step-by-step solutions; Interpreting data in written text.

2. Validation Questionnaire: Used by expert validators to assess the feasibility of the developed learning model.
3. Observation Sheets: To record the implementation of scaffolding during the learning process.

Data Analysis

Data were analyzed through several steps:

1. Model Validation: Validation was conducted by eight experts. After revisions, the final model was applied once deemed suitable.
2. Effectiveness Test: The effectiveness of the learning model was measured using effect size calculations. The formula used is:

$$d = \frac{(M_2 - M_1)}{S_{pooled}} \quad \text{dengan} \quad S_{pooled} = \sqrt{\frac{S_1^2 + S_2^2}{2}}$$

The categories of effect size are as follows:

- $d \geq 0.8$: Large
- $0.2 \leq d < 0.8$: Medium
- $d < 0.2$: Small

3. Formative and Summative Evaluation:
    - Formative Evaluation: Conducted at each stage of development to ensure the process aligns with the objectives.
    - Summative Evaluation: Conducted after implementation to assess improvements in students' mathematical representation skills.

The results of the evaluations were used to refine and improve the learning model before broader application.

RESULTS AND DISCUSSION

Result

This study aims to develop and test the effectiveness of a Realistic Mathematics Education (RME) model supported by scaffolding to enhance students' mathematical representation skills. The research process follows the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. Each stage is carried out systematically to ensure that the resulting learning model is effective and meets the needs of the students.

1. **Analysis Stage**

   At the analysis stage, the researcher identified the needs of students in learning mathematics, particularly their mathematical representation skills. Initial findings revealed that many students in the Mathematics Education program at UIN Raden Intan Lampung face difficulties in understanding abstract mathematical concepts. These challenges arise because students struggle to connect these abstract concepts to their daily experiences or represent them in visual, symbolic, or verbal forms. The needs analysis also showed that mathematical representation skills are crucial as they form the foundation for understanding more complex mathematical concepts. These skills enable students to present mathematical ideas more clearly, whether through graphs, tables, diagrams, or symbolic equations. Therefore, developing a learning model that enhances these skills is considered essential, especially by utilizing the RME approach, which connects mathematics to real-life contexts, and scaffolding as a step-by-step learning support.

2. **Design Stage**

   In the design stage, the researcher developed a learning model based on RME supported by scaffolding. This design included the creation of learning activities grounded in RME principles, which emphasize the use of real-life contexts to explain mathematical concepts. Using the RME approach, students were introduced to problems related to everyday life to help them understand mathematical concepts more concretely. Additionally, scaffolding was prepared to support the learning process. Gradual support was provided, starting with detailed and intensive guidance during the early stages of learning. As students' understanding improved, the scaffolding was gradually reduced, allowing them to become independent in solving mathematical problems. Representation tools, such as diagrams, graphs, and mathematical symbols, were also designed to help students visualize and solve mathematical problems effectively. This learning design focused not only on improving students' mathematical representation skills but also on creating an interactive learning experience that is relevant to their needs.

3. **Development Stage**

After completing the design, the development stage was carried out. In this stage, the designed learning model was tested and validated by eight expert validators, including mathematics education specialists and experts in learning model development. The validation process involved several revisions and improvements until the model was deemed feasible for implementation in the field. Feedback from the experts indicated that the RME model supported by scaffolding showed strong potential for improving mathematics learning, particularly in enhancing students' mathematical representation skills. The validation covered various aspects, such as the relevance of real-world contexts used in the learning process, the alignment of scaffolding with students' abilities, and the clarity of the representation tools designed.

4. **Implementation Stage**

Following the development stage, the learning model was implemented with second-semester students from classes A, C, and D in the Mathematics Education program at UIN Raden Intan Lampung. A total of 50 students participated in this stage. During the implementation, significant improvements were observed in the students' mathematical representation skills. Students who initially struggled to represent mathematical concepts began to demonstrate better abilities in using graphs, diagrams, symbols, and other forms of representation. They were also able to connect the mathematical concepts they learned with real-life problems. The step-by-step scaffolding process helped students develop independent thinking skills. Initially, they relied heavily on instructor support, but over time, this support was gradually reduced, and students were able to solve problems more independently.

5. **Evaluation Stage**

The evaluation was conducted in two forms: formative and summative evaluations. Formative evaluation was carried out during the development and implementation processes to ensure that each stage proceeded as planned and achieved the learning objectives. The researcher made revisions and adjustments based on feedback gathered during this stage. Summative evaluation was conducted after the implementation to assess the impact of the learning model on students' mathematical representation skills. This was done through pretest and posttest measurements to evaluate changes in the students' abilities. The results of the effect size calculation are presented as follows:

Table 2. Effect Size Calculation

Category	N	M1,2	SD1,2	SDpooled	ES
Mathematics Education UIN Raden Intan Lampung	50	38.43	44.42	40.838	0.9
		75.55	36.91		

The evaluation results indicate that the developed learning model demonstrates a high level of effectiveness in improving students' mathematical representation skills. The effectiveness test, conducted using the effect size calculation, produced a value of 0.9, which falls into the large category. This finding shows that the RME model supported by scaffolding has a significant impact on enhancing students' mathematical representation abilities. Students were not only able to better understand mathematical concepts but also effectively communicate their understanding through various forms of mathematical representations.

Discussion

The development of the Realistic Mathematics Education (RME) model combined with scaffolding followed a structured process using the ADDIE framework, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

- In the Analysis stage, the researcher identified key challenges faced by students, particularly their struggles with understanding abstract mathematical concepts and representing them visually, symbolically, or verbally. These findings highlighted the need for a learning model that integrates real-world contexts and provides gradual learning support through scaffolding.
- The Design stage focused on creating a learning model based on RME principles, where students worked on real-life problems to contextualize mathematical concepts. Scaffolding was embedded into the design to offer step-by-step guidance, starting with intensive support that was gradually reduced. The model also included tools for mathematical representation, such as diagrams, graphs, and symbolic equations, to enhance students' understanding.
- During the Development stage, the model underwent validation by eight expert validators, including specialists in mathematics education and instructional design. The validation process involved assessing the model's relevance, practicality, and feasibility. Feedback from the experts emphasized the strengths of the model, particularly its ability to connect real-life contexts with abstract mathematical concepts and the suitability of scaffolding strategies for diverse student abilities. Several iterations of revisions were made based on the validators' suggestions, ensuring that the model met high standards of validity and practicality. By the end of the development phase, the model was deemed valid and ready for implementation. The validation results showed that the model effectively addressed students' learning needs and aligned well with instructional objectives.
- In the Implementation stage, the validated model was applied to 50 second-semester students in the Mathematics Education program at UIN Raden Intan Lampung. The implementation phase revealed that the model facilitated active engagement and meaningful learning among students.
- Lastly, the Evaluation stage involved formative and summative assessments to ensure the model's effectiveness. The formative evaluation, conducted during

development, ensured each stage aligned with the learning goals, while the summative evaluation measured the model's impact after implementation.

The validation process by experts confirmed that the developed RME model with scaffolding was both valid and practical, making it a suitable tool for improving students' mathematical representation skills in diverse learning contexts.

The implementation of the developed RME model with scaffolding significantly enhanced students' mathematical representation skills. Pretest and posttest results indicated substantial improvements in students' ability to use visual, symbolic, and verbal forms of representation. The calculated effect size of 0.9 demonstrated a high level of effectiveness, confirming the model's impact on learning outcomes. Before the intervention, many students struggled to represent mathematical concepts clearly and connect them to real-life contexts. After using the model, students showed marked progress in creating diagrams, graphs, and symbolic equations to solve problems. They also improved their ability to explain mathematical concepts verbally, demonstrating a deeper understanding of the material. The real-world contexts provided by the RME approach helped students relate abstract mathematical ideas to practical situations, making the concepts more meaningful. Meanwhile, the scaffolding process gradually built students' confidence and independence in problem-solving. Initially, students relied heavily on instructor guidance, but as the scaffolding was reduced, they became more capable of solving problems on their own. This progression highlights the model's effectiveness in fostering both skill development and independent thinking. Overall, the findings indicate that the RME model with scaffolding successfully addressed students' learning needs, providing a structured and impactful approach to improving mathematical representation skills.

The findings of this study align with previous research that highlights the benefits of the RME approach in improving mathematics learning. For example, Kusumaningrum and Nuriadin (2022) found that RME enhances problem-solving and mathematical literacy. However, this study goes further by focusing specifically on mathematical representation skills, which have received less attention in earlier studies. Research by Warsito et al. (2018) also pointed out the value of RME in connecting abstract ideas to real-life problems, but it did not examine the role of scaffolding. This study fills that gap by showing how scaffolding strengthens the RME approach, especially in helping students visualize and interpret mathematical concepts. Unlike earlier studies that focused on delivering mathematical content, this research highlights the importance of integrating teaching strategies that also build essential skills. This contribution shows the potential of combining innovative methods to improve learning outcomes in mathematics.

The success of the RME model supported by scaffolding can be explained by several factors. First, the use of real-world contexts made abstract mathematical concepts easier for students to understand. Real-life problems provided meaningful connections, which aligns with the principles of RME (Güler, 2018; Yilmaz, 2019). Second, scaffolding gave students the right amount of support during the learning process. Based on Vygotsky's Zone of Proximal Development (ZPD), scaffolding helped students achieve tasks they could not complete on their own (Joda, 2019; Shemy, 2022). As students' understanding grew, the level of assistance was gradually reduced, allowing them to solve problems independently. The inclusion of representation tools, such as diagrams, graphs, and mathematical symbols, further helped students visualize and explain mathematical ideas. These tools made the transition from concrete examples to abstract thinking smoother. This structured approach not only improved representation skills but also encouraged critical thinking and problem-solving abilities. The combination of RME and scaffolding creates a supportive learning environment where students can develop both their skills and confidence.

Implication

The findings of this study have practical implications for mathematics educators. The RME model supported by scaffolding offers a structured framework that can be used in various educational settings. Teachers can design lessons that connect mathematical concepts to real-world situations, making the subject more engaging and easier for students to understand. By using scaffolding, educators can provide step-by-step guidance that matches students' needs and abilities. As students improve, the support can be reduced, encouraging them to become more independent in their learning. This approach is particularly useful in classrooms with diverse learning abilities, as it adapts to each student's level of understanding. The study also suggests that this model could be integrated into teacher training programs to help educators implement it effectively. By adopting this method, schools and universities can improve the quality of mathematics education and better prepare students for real-world challenges.

Limitation

Despite its positive results, this study has some limitations. First, the sample size was relatively small, with only 50 students from a single institution, which may limit the generalizability of the findings. Second, the study focused only on mathematical representation skills and did not explore other important competencies, such as reasoning or communication. The implementation period was also relatively short, which may not fully capture the long-term impact of the model. Additionally, the challenges teachers might face in applying this model in larger or more diverse classrooms were not examined. Future studies could address these issues by including larger and more diverse samples, extending the implementation period, and exploring the impact of the model on other mathematical skills. Such efforts would provide a more comprehensive understanding of the model's effectiveness.

This study makes an important contribution to mathematics education by combining RME with scaffolding to address specific learning challenges. The findings provide evidence that this model improves mathematical representation skills, which are essential for understanding and applying mathematical concepts. Unlike traditional teaching methods that focus mainly on delivering content, this model encourages students to actively engage in the learning process. It also emphasizes the use of real-world contexts and structured guidance, making mathematics more relevant and accessible to students. These contributions are valuable for educators and curriculum developers looking for innovative ways to improve mathematics learning. Furthermore, this study offers practical strategies for implementing integrated learning models that meet the needs of diverse learners. By bridging theory and practice, this research provides a foundation for future studies and advancements in teaching methods.

CONCLUSIONS

This study developed and validated a Realistic Mathematics Education (RME) model supported by scaffolding using the ADDIE framework, ensuring a systematic and practical design. Validation by eight expert validators confirmed the model's feasibility and relevance in addressing students' challenges in understanding abstract mathematical concepts. The implementation demonstrated significant improvements in students' mathematical representation skills, as evidenced by a high effect size of 0.9. The RME approach, combined with scaffolding, helped students relate mathematical ideas to real-life contexts while gradually building their independence in problem-solving. These findings highlight the model's effectiveness in fostering both conceptual understanding and critical thinking. This research contributes to mathematics education by offering a practical and impactful learning strategy, with potential for broader applications in other competencies and diverse educational settings.

AUTHOR CONTRIBUTION STATEMENTS

Rizki Wahyu Yunian Putra: Contributed to the conception and design of the study, conducted the data collection and analysis, and prepared the initial draft of the manuscript. Rizki was responsible for implementing the developed learning model and coordinating with the participants during the study.

Sugeng Sutiarso: Provided guidance and expertise in the development of the research framework and methodology, specifically in the application of the ADDIE model. Sugeng also supervised the validation process and reviewed the manuscript for academic rigor and coherence.

Nurhanurawati: Played a significant role in supervising the research design and ensuring the relevance of the Realistic Mathematics Education (RME) and scaffolding principles applied in the study. Nurhanurawati also contributed to the interpretation of the findings and the final review of the manuscript.

REFERENCES

Ahmad, E. G., Arnawa, I. M., Asmar, A., Musdi, E., & Rifandi, R. (2023). Developing instructional design of statistics material based on realistic mathematics education (RME) to improve mathematical communication ability and learning independence for junior high school grade VIII students. In *AIP Conference Proceedings* (Vol. 2698, No. 1). AIP Publishing. Scopus. https://doi.org/10.1063/5.0122408

Andison, A., & Armiati, A. (2020). Development of mathematical learning devices based on realistic mathematics education (RME) in senior vocational school. In *Journal* *of Physics: Conference Series* (Vol. 1554, No. 1, p. 012070). IOP Publishing. Scopus. https://doi.org/10.1088/1742-6596/1554/1/012070

Andriani, L., & Fauzan, A. (2019). The impact of rme-based design instructional on students' mathematical communication ability. *International Journal of Scientific and Technology Research*, *8*(12), 2646–2649. Scopus.

Astutik, E. P. (2020). Scaffolding dalam Pembelajaran Matematika Berbasis Kearifan Budaya Osing Banyuwangi untuk Meningkatkan Representasi Matematis Siswa. *Jurnal Teknodik*, *24*(1), 51–60. https://doi.org/10.32550/teknodik.v0i2.686

Cahyo, A. N., & Sutarni, S. (2023). Mathematical literacy ability of class V elementary school students through RME model in solving HOTS questions. In *AIP Conference Proceedings* (Vol. 2727, No. 1). AIP Publishing. Scopus. https://doi.org/10.1063/5.0141698

Dhonna, R., Maulana, M., & Irawati, R. (2024). Peningkatan Pemahaman Konsep Pecahan melalui Pendekatan Realistic Mathematic Education (RME) Berbantuan Media Puzzle. *JagoMIPA: Jurnal Pendidikan Matematika Dan IPA*, *4*(1), 189–197. https://doi.org/10.53299/jagomipa.v4i1.533

Fauzana, R., Dahlan, J. A., & Jupri, A. (2020). The influence of realistic mathematics education (RME) approach in enhancing students' mathematical literacy skills. In *Journal of Physics: Conference Series* (Vol. 1521, No. 3, p. 032052). IOP Publishing. Scopus. https://doi.org/10.1088/1742-6596/1521/3/032052

Goolla, R., Ravindar, B., Krishna, C. B. R., & Dugyala, P. (2024). The effect of RME on mathematical creative thinking skills of engineering students. In *AIP Conference Proceedings* (Vol. 2971, No. 1). AIP Publishing. Scopus. https://doi.org/10.1063/5.0195763

Güler, H. (2018). Activities Written by Prospective Primary Teachers on Realistic Mathematics Education. *International Journal of Evaluation and Research in Education (IJERE)*, *7*(3). https://doi.org/10.11591/ijere.v7i3.14267

Hafriani, H. (2021). Mengembangnkan Kemampuan Dasar Matematika Siswa Berdasarkan NCTM Melalui Tugas Terstruktur Dengan Menggunakan ICT (Developing The Basic Abilities of Mathematics Students Based on NCTM Through Structured Tasks Using ICT). *Jurnal Ilmiah Didaktika: Media Ilmiah Pendidikan Dan Pengajaran*, *22*(1), 63. https://doi.org/10.22373/jid.v22i1.7974

Joda, F. M. (2019). Effects of Instructional Scaffolding Strategy on Senior Secondary Biology Students' Academic Achievement and Retention in Taraba State, Nigeria. *Education Quarterly Reviews*, *2*(2). https://doi.org/10.31014/aior.1993.02.02.59

Kusumaningrum, R. S., & Nuriadin, I. (2022). Pengaruh Pendekatan Matematika Realistik Berbantu Media Konkret terhadap Kemampuan Representasi Matematis Siswa. *Jurnal Basicedu*, *6*(4), 6613–6619. https://doi.org/10.31004/basicedu.v6i4.3322

Nurdin, E. (2019). Pengembangan Lembar Kerja Berbasis Pendekatan Terbimbing untuk Memfasilitasi Kemampuan Representasi Matematis Mahasiswa. *Suska Journal of Mathematics Education*, *5*(2), 111. https://doi.org/10.24014/sjme.v5i2.7304

Nurhayanti, H., Hendar, H., & Kusmawati, R. (2022). Model Realistic Mathematic Education dalam Meningkatkan Pemahaman Konsep Matematika pada Materi Pecahan. *Jurnal Tahsinia*, *3*(2), 156–166. https://doi.org/10.57171/jt.v3i2.334

Priciliya, S., Sunardi, Yudianto, E., & Susanto. (2022). Development of student's worksheet based on realistic mathematics education (RME) approach to know students' mathematical problem solving abilities. In *AIP Conference*

Proceedings (Vol. 2633, No. 1). AIP Publishing. Scopus. https://doi.org/10.1063/5.0102677

Purwanti, K. L., Sukestiyarno, Waluya, B., & Rochmat. (2019). Mathematical literacy ability with RME (realistic mathematics education) approach in fifth grade students. In *Journal of Physics: Conference Series* (Vol. 1321, No. 2, p. 022118). IOP Publishing. Scopus. https://doi.org/10.1088/1742-6596/1321/2/022118

Putri, D. M. & Suparman. (2019). Design of rme-based mathematical module development in improving problem solving ability. *International Journal of Scientific and Technology Research*, *8*(10), 3629–3634. Scopus.

Qurohman, M. T., Wardana, A., & Romadhon, S. A. (2024). Efektivitas Pendekatan Kontekstual Dalam Pengajaran Matematika Teknik: Studi Kuantitatif di Perguruan Tinggi. *Jurnal Riset Dan Inovasi Pembelajaran*, *4*(2), 1198–1207. https://doi.org/10.51574/jrip.v4i2.1978

Rahayu, P., Warli, W., & Cintamulya, I. (2020). Tehnik Scaffolding dalam Meningkatkan Kemampuan Membuktikan Pernyataan pada Mahasiswa. *JIPMat*, *5*(2), 231–239. https://doi.org/10.26877/jipmat.v5i2.6991

Ramadhani, S. N., Yerizon, & Asmar, A. (2023). The practicality of mathematical learning tools (RPP and LKPD) based on RME approach on student grade X SMA/MA to mathematical communication ability. In *American Institute of Physics Conference Series* (Vol. 2698, No. 1, p. 060026). Scopus. https://doi.org/10.1063/5.0122475

Retnodari, W., Faddia Elbas, W., & Loviana, S. (2020). Scaffolding Dalam Pembelajaran Matematika. *LINEAR: Journal of Mathematics Education*, *1*(2009), 15. https://doi.org/10.32332/linear.v1i1.2166

Shemy, N. (2022). Effect of Different Levels of Constructivist Scaffolding within E-Content on Undergraduate Students' Mastery of Learning and their Attitudes towards it. *Journal of Education and E-Learning Research*, *9*(1). https://doi.org/10.20448/jeelr.v9i1.3737

Suardipa, I. P. (2020). Proses Scaffolding pada Zone of Proximal Development (ZPD) dalam Pembelajaran. *Widyacarya*, *4*(1), 79–92.

Warsito, Darhim, D., & Herman, T. (2018). Improving students' mathematical representational ability through RME-based progressive mathematization. In *Journal of Physics: Conference Series* (Vol. 948, No. 1, p. 012038). IOP Publishing. Scopus. https://doi.org/10.1088/1742-6596/948/1/012038

Wesna, M., Wardono, & Masrukan. (2021). Mathematical literacy ability in terms of the independent learning students on reciprocal teaching learning models with approaching RME assisted by google classroom. In *Journal of Physics: Conference Series* (Vol. 1918, No. 4, p. 042040). IOP Publishing. Scopus. https://doi.org/10.1088/1742-6596/1918/4/042040

Yilmaz, R. (2019). Prospective Mathematics Teachers' Cognitive Competencies on Realistic Mathematics Education. *Journal on Mathematics Education*, *11*(1). https://doi.org/10.22342/jme.11.1.8690.17-44

Zuniar, F. (2020). Penerapan Model Pembelajaran Student Facilitator And Explaining (SFAE) untuk Meningkatkan Pembelajaran IPS. *Kalam Cendekia: Jurnal Ilmiah Kependidikan*, *9*(1), 460–465. https://doi.org/10.20961/jkc.v9i1.53799