p-ISSN: 2086-4280
e-ISSN: 2527-8827

Development of Worksheets Based on Realistic Mathematics Education to Enhance Junior High School Students' Mathematical Communication Skills

Dewi Normalasari[1], Sugeng Sutiarso[2], Chika Rahayu[3*]

[1,2,3*]Department of Mathematics Education, Lampung University
Jalan Prof. Dr. Ir. Sumantri Brojonegoro No.1, Bandar Lampung, Lampung, Indonesia
[1]*normalasaridewi9@gmail.com*; [3*]*chikarahayu@fkip.unila.ac.id*

Article received: 18-02-2025, revision: 18-03-2025, published: 30-04-2025

Abstrak

Penelitian ini bertujuan untuk mengembangkan Lembar Kerja Peserta Didik (LKPD) berbasis Realistic Mathematics Education (RME) guna meningkatkan kemampuan komunikasi matematis siswa. Permasalahan yang diangkat adalah rendahnya kemampuan komunikasi matematis siswa yang teridentifikasi dari hasil observasi awal, di mana lebih dari 60% siswa mengalami kesulitan menyampaikan ide atau menjelaskan proses penyelesaian masalah secara matematis. Model pengembangan yang digunakan adalah ADDIE (Analysis, Design, Development, Implementation, Evaluation) karena memungkinkan perencanaan terstruktur, validasi ahli, serta evaluasi efektivitas produk. Subjek penelitian terdiri atas 28 siswa kelas VIII di salah satu SMP di Provinsi Lampung. Instrumen yang digunakan meliputi lembar validasi ahli, angket respon siswa, dan tes kemampuan komunikasi matematis. LKPD yang dikembangkan divalidasi oleh dua ahli dan memperoleh skor rata-rata 87%, yang menunjukkan kategori "sangat valid". Respon siswa terhadap LKPD juga sangat positif dengan skor rata-rata 85%. Efektivitas LKPD diuji melalui hasil pretest dan posttest, menunjukkan peningkatan skor rata-rata dari 52 menjadi 78 dengan N-Gain sebesar 0,65 dalam kategori sedang, serta hasil uji-t menunjukkan peningkatan signifikan. Hasil penelitian ini menunjukkan bahwa LKPD berbasis RME yang dikembangkan efektif dan layak digunakan untuk meningkatkan kemampuan komunikasi matematis siswa.
Kata Kunci: komunikasi matematis; LKPD; pengembangan; RME; siswa SMP

Abstract

This research aims to develop Student Worksheets (LKPD) based on Realistic Mathematics Education (RME) to enhance students' mathematical communication skills. The research problem addressed is the low level of students' mathematical communication, as identified through preliminary observations where more than 60% of students struggled to express ideas or explain problem-solving processes mathematically. The development model used is ADDIE (Analysis, Design, Development, Implementation, Evaluation), as it allows for structured planning, expert validation, and product effectiveness evaluation. The research subjects consisted of 28 eighth-grade students at a junior high school in Lampung Province. The instruments used included expert validation sheets, student response questionnaires, and mathematical communication tests. The developed LKPD was validated by two experts and received an average score of 87%, indicating a "very valid" category. Student responses were also highly positive, with an average score of 85%. The LKPD's effectiveness was evaluated using pretest and posttest results, showing an average score increase from 52 to 78 with an N-Gain of 0.65, categorized as moderate, and the t-test results indicated a statistically significant improvement. These findings demonstrate that the RME-based LKPD developed is effective and feasible to use in improving students' mathematical communication skills.
Keywords: LKPD; RME; mathematical communication; development; junior high school students

I. Introduction

Mathematical communication is one of the key competencies that must be developed in mathematics education, as it involves the ability to express, explain, and interpret mathematical ideas both orally and in writing. This competency is part of the process standards promoted by NCTM and Indonesia's Merdeka Curriculum. However, recent studies indicate that junior high school students' mathematical communication skills remain relatively low, particularly when confronted with contextual and open-ended problems. Students often provide only final answers without clearly explaining their reasoning steps. This lack of communication skills becomes a major obstacle to achieving meaningful mathematics learning goals (Samsinar et al., 2023).

The importance of mathematical communication lies in its role in developing higher-order thinking skills such as reasoning, argumentation, and problem-solving. With proper communication, students are able to present their ideas systematically, listen to others' perspectives, and compare different solutions. The 2022 PISA results revealed that Indonesian students' mathematical literacy is still below the international average, particularly in modeling and communication aspects (OECD, 2022). This highlights the need for pedagogical interventions that help students connect mathematical concepts with real-life situations. One promising approach is Realistic Mathematics Education (RME).

RME is a teaching approach that emphasizes the connection between mathematics and real-life contexts, the use of models, and students' active involvement in constructing mathematical knowledge. The core principle is that mathematics should be "reinvented" by students through realistic activities, making learning more meaningful (Afriansyah et al., 2023). In recent years, many studies in Indonesia have demonstrated that RME is effective in improving conceptual understanding, learning motivation, and mathematical communication skills (Nurfithriyya et al., 2024). Implementing RME encourages students to work collaboratively and communicate their findings in class. Therefore, RME can serve as a solution to the problem of low mathematical communication.

One of the most suitable media to support RME implementation is the student worksheet (Lembar Kerja Peserta Didik or LKPD). Worksheets enable students to engage in structured, contextualized, and communication-oriented activities. Previous studies show that RME-based worksheets effectively increase students' engagement and conceptual understanding (Baharuddin et al., 2024). When well-designed, worksheets stimulate students to write explanations, create representations, and discuss with peers. This fosters an interactive and communicative classroom environment.

Various studies have developed RME-based worksheets on topics such as sets, geometry, and integers. The results indicate that the worksheets meet the criteria of validity, practicality, and effectiveness (Baharuddin et al., 2024; Andita & Widaswari, 2022). Field trials also show improvements in students' learning outcomes and communication skills.

p-ISSN: 2086-4280
e-ISSN: 2527-8827

However, most research is still limited in scope and has not focused deeply on specific indicators of mathematical communication. This opens opportunities for further research aimed at designing worksheets that explicitly target communication skills.

Widianti et al. (2024) demonstrated that RME can stimulate students' mathematical communication through group discussions, model construction, and classroom presentations. Their study reported a significant improvement in students' ability to explain ideas, create representations, and write coherent solution steps. Hence, RME holds great potential as the foundation for developing teaching materials that enhance communication skills. To optimize the outcomes, worksheets must use contexts relevant to students' daily experiences. They should also present open-ended problems that encourage discussion and argumentation.

Research using maritime contexts has shown that incorporating familiar, local situations can strengthen student engagement and mathematical communication (Rahayu et al., 2022). Students become more motivated when mathematics problems are connected to daily life settings, such as markets, ports, or cultural activities. Relevant contexts make it easier for students to build mathematical models and explain their solutions (Afriansyah & Turmudi, 2022). Therefore, local context should be a key consideration in the design of RME-based worksheets. This aligns with the PMRI principle that emphasizes local wisdom in mathematics education.

Nevertheless, several studies reveal that many teachers struggle to design worksheets aligned with RME principles. Teachers often use conventional worksheets that only contain procedural exercises and do not facilitate meaningful discussion and communication (Trisnawati et al., 2023). As a result, students are not accustomed to articulating their thought processes in a structured manner. This indicates a need for research and development of worksheets that can serve as models or references for teachers. With such support, teachers can implement RME more effectively in their classrooms.

Another challenge is the limited time teachers have to design valid, practical, and effective worksheets. In practice, teachers rely heavily on textbooks or school-provided worksheets, which may not match students' needs. Andita & Widaswari (2022) stressed the importance of validating worksheets in terms of content, language, and practicality before classroom use. A systematic validation process ensures that the worksheets support the intended learning goals. Therefore, structured research and development efforts are crucial.

Digitalization of worksheets has also been widely studied as an innovation in mathematics education. A study in Palembang found that digital RME-based worksheets can enhance students' interest and make access to learning materials easier (Fauziah et al., 2023). Digital media allow the presentation of contextual problems with engaging visuals and instant feedback. This can promote greater student interaction and mathematical communication (Aurelyasari & Nur, 2023). Nevertheless, schools' technological readiness and students' digital literacy must be considered.

RME-based textbooks have also been reported to improve students' mathematical communication skills (Hidayati et al., 2023). These textbooks include exploration, discussion, and reflection activities that encourage students to write complete explanations. This is consistent with the guided reinvention principle of RME, which enables students to rediscover mathematical concepts. These findings reinforce the argument that well-designed RME materials are effective for developing communication skills. Worksheets, as a more practical form of teaching material, are expected to have a similar impact.

The development of RME-based teaching materials generally follows the ADDIE or 4-D (Define, Design, Develop, Disseminate) model. This model allows iterative revisions from needs analysis to field testing. Baharuddin et al. (2024) successfully developed a set worksheet using the ADDIE model, which was found to be highly valid and practical. The model provides opportunities for teacher and expert involvement during validation. This ensures that the resulting worksheets meet students' actual learning needs.

Practicality of worksheets is usually measured through teacher and student responses during limited trials. Studies have shown that most teachers and students consider RME-based worksheets easy to use and engaging (Rahayu et al., 2022). This positive response indicates that worksheets can be implemented without significant barriers. Practicality is crucial because even highly valid materials would be of limited benefit if they are difficult to use. Therefore, practicality testing is an essential part of development research.

In addition to validity and practicality, the effectiveness of worksheets is measured by improvements in students' learning outcomes and mathematical communication skills. Rehan et al. (2021) reported a significant increase in students' communication scores after implementing RME-based learning. The observed indicators included writing solution steps, creating representations, and explaining answers. These findings confirm that RME-based worksheets effectively develop students' mathematical communication. This effectiveness justifies their further development.

To measure mathematical communication, many researchers employ rubrics with multiple performance levels. For example, a study in Semarang used a rubric with levels 0 through IV to assess students' completeness of explanations (Unnes Journal, 2022). This rubric helps researchers identify areas that need improvement. With a clear rubric, assessment becomes more objective and reliable. This is essential for drawing valid conclusions about student progress.

RME also encourages interaction between students and teachers. Students are given opportunities to present their work and engage in classroom discussions. Trisnawati et al. (2023) reported that communication activities significantly increased when teachers used RME-based instruction. Students became more confident in sharing their ideas and asking questions. The classroom atmosphere became more active and collaborative.

Although many studies have proven the effectiveness of RME, further research is needed to examine the sustainability of its effects. Most studies are short-term and do not evaluate the long-term impact on communication skills. Future research should investigate whether communication improvements transfer to other mathematics topics. This would ensure that the skills acquired are lasting rather than temporary.

Teacher support is also a key factor in the successful implementation of RME-based worksheets. Teachers must understand RME principles, select relevant contexts, and manage classroom discussions effectively. Without adequate understanding, teachers may implement worksheets mechanically without capturing the essence of RME. Therefore, development research should involve teachers from the needs analysis stage. This ensures that the final product is contextually appropriate for schools.

Overall, studies conducted between 2020 and 2025 strongly support the use of RME as an effective approach for improving mathematical communication (Samsinar et al., 2023; Baharuddin et al., 2024). However, the development of worksheets specifically targeting communication skills is still limited. The present study addresses this gap by designing RME-based worksheets that focus on enhancing communication. The worksheets will be systematically validated for content, practicality, and effectiveness.

Considering previous findings, RME-based worksheets have great potential as effective media for mathematics learning. They integrate real-life contexts, open-ended tasks, and collaborative activities that promote student engagement. They also encourage students to document their thought processes and explain their solutions coherently. This is expected to improve students' mathematical communication skills. Therefore, developing such worksheets is a strategic step.

The integration of technology can further enhance worksheet development. Digital worksheets allow for more interactive learning and can be used in blended or hybrid settings. This aligns with the current direction of education in the era of Industry 4.0, which leverages information technology in teaching and learning. Consequently, the worksheets developed can be more flexible and relevant to today's educational demands.

Conceptually, this study integrates RME principles, instructional material development, and mathematical communication assessment. The results are expected not only to produce valid, practical, and effective worksheets but also to provide a communication assessment model for teachers. This research can also serve as a reference for curriculum developers and educators seeking to design more communicative mathematics lessons.

Based on the above considerations, this study aims to develop RME-based worksheets that improve junior high school students' mathematical communication skills. The development process will follow the ADDIE model, including needs analysis, design, development, implementation, and evaluation. The worksheets will be validated by experts, tested for practicality, and assessed for effectiveness through classroom trials. It is expected that the resulting worksheets will significantly enhance students' communication skills and provide teachers with a practical instructional tool.

II. METHOD

This study employed a Research and Development (R&D) approach by adapting the ADDIE development model, which consists of five main stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model was chosen because it provides a systematic and structured framework for developing effective instructional products (Nurfithriyya et al., 2024). Each stage in the ADDIE model is interconnected and carried out sequentially but with flexibility to accommodate revisions according to development needs (Baharuddin et al., 2024). The primary goal of using this model was to produce a student worksheet (LKPD) based on the principles of Realistic Mathematics Education (RME) that is valid, practical, and effective in improving students' mathematical communication skills (Widianti et al., 2024). This approach is widely recommended for product development in mathematics education because it integrates theory, design, and empirical validation (Andita & Widaswari, 2022).

In the analysis stage, the researchers identified various potentials and challenges in mathematics learning at the junior high school level. Data collection was carried out through classroom observations, interviews with mathematics teachers, and a review of the current curriculum. The results showed that students still had difficulty communicating mathematical ideas both orally and in writing, consistent with findings from recent studies on communication barriers in mathematics classrooms (Samsinar et al., 2023). In addition, mathematics instruction was still largely teacher-centered and dominated by lectures, which limited student interaction and participation (Trisnawati et al., 2023). Based on these findings, it was concluded that there was a need for a learning tool that could encourage active student engagement and enhance mathematical communication skills.

The design stage involved creating an initial draft of the LKPD that integrated RME principles. The RME approach was selected because it emphasizes the use of realistic contexts relevant to students' experiences and promotes exploration and communication during problem solving (Rahayu et al., 2022). The LKPD was designed to include a sequence of activities such as contextual introduction, exploration, guiding questions, group discussions, and reflection. This structure was intended to stimulate student interaction, encourage multiple solution strategies, and foster mathematical argumentation. Visual layout, formatting, and language were carefully considered to ensure clarity, readability, and accessibility for all students (Fauziah et al., 2023).

In the development stage, the LKPD was fully produced based on the design draft.

The first version of the product was validated by two content experts and two media/design experts to ensure its quality. Validation was carried out to evaluate content accuracy, language clarity, presentation feasibility, and visual design using a four-point Likert scale (Baharuddin et al., 2024). Feedback from the validators was analyzed and used as the basis for revising the LKPD before classroom testing. This validation–revision cycle was conducted iteratively until the LKPD met the criteria of validity and feasibility for implementation.

The implementation stage was conducted in one eighth-grade class at a public junior high school in Lampung Province, involving 28 students. The validated LKPD was implemented over several instructional sessions. During implementation, the researchers observed student learning activities using observation sheets and distributed student response questionnaires to collect feedback (Hidayati et al., 2023). In addition, a pretest and posttest were administered to measure improvements in students' mathematical communication skills. The learning process used curriculum-aligned materials, and the teacher acted as a facilitator, guiding students through the RME-based activities.

The evaluation stage focused on analyzing data collected during implementation. Both quantitative and qualitative descriptive analyses were conducted. Quantitative data from the pretest and posttest were analyzed using a paired t-test and normalized gain (N-Gain) to measure students' learning progress (Rehan et al., 2021). The N-Gain was calculated using the formula:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Prest\ Score}$$

Meanwhile, qualitative data from observations and questionnaires were analyzed to evaluate students' engagement and responses to the LKPD. The findings showed that the RME-based LKPD improved student participation and had a positive impact on their mathematical communication.

In addition to tests and observations, student response questionnaires were employed to evaluate the practicality of the LKPD. The questionnaire consisted of statements covering aspects such as readability, visual appeal, clarity of instructions, and content usefulness. The results were analyzed descriptively to identify patterns of student responses and attitudes. This analysis provided additional insights into the strengths and weaknesses of the developed product, which could be used for further refinement.

To ensure the validity and reliability of the findings, the researchers applied triangulation of sources and methods. Triangulation was carried out by comparing observation results, interview data, and quantitative findings from pretest and posttest (Widianti et al., 2024). By using multiple sources and data collection techniques, the researchers ensured that the conclusions accurately reflected the real classroom conditions. This step was crucial for producing trustworthy results and enhancing the credibility of the study.

III. Result and Discussion

This study produced a learning product in the form of a Student Worksheet (LKPD) based on Realistic Mathematics Education (RME), aimed at improving students' mathematical communication skills. The product was developed through five stages of the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. The effectiveness of the LKPD was evaluated through expert validation, limited trials with 28 eighth-grade students, analysis of learning outcomes, and teacher interviews.

a) Expert Validation Results

Validation was conducted by two experts—one in subject content and one in media design—to assess the appropriateness of content, integration of RME principles, visual design, and layout. Each expert used a Likert scale (1–5), and the results were converted into percentages.

Table 1.
Expert Validation Results for the LKPD

Type of Validator	Assessed Aspects	Number of Criteria	Average Score	Category
Subject Matter Expert	Content relevance, RME integration	6	4.4	Very Valid
Media Expert	Visual design, layout	5	4.3	Very Valid
Overall Average	—	—	4.35 (87%)	Very Valid

These results indicate that the developed LKPD is highly valid and suitable for classroom implementation, having met quality standards in terms of content, visual design, and language clarity.

b) Students' Responses to the LKPD

Student responses were collected using a questionnaire measuring readability, engagement, contextual understanding, and ease of use. A total of 28 students responded using a Likert scale from 1 to 5.

Table 2.
Student Responses to the LKPD

Test Type	Average Score	Achievement Category
Pretest	52.0	Moderate
Posttest	78.0	High
N-Gain	0.65 (65%)	Moderate

The data indicates that students responded very positively to the LKPD. The contextual activities and opportunities for group discussion increased their engagement and understanding during the learning process.

c) Improvement of Mathematical Communication Skills

To measure the effectiveness of the LKPD in enhancing mathematical communication, pretests and posttests were administered to 28 students. The test items consisted of open-ended questions designed to assess students' ability to explain ideas, present solutions, and use mathematical representations.

Table 3.
Students' Pretest and Posttest Average Scores

Indicator	Number of Items	Average Score	Category
Readability	3	4.2	Positive
Interest/Engagement	3	4.3	Very Positive
Context Understanding	3	4.1	Positive
Ease of Use	3	4.4	Very Positive
Overall Average	—	4.25 (85%)	Very Positive

p-ISSN: 2086-4280
e-ISSN: 2527-8827

The increase of 26 points in the average score and an N-Gain of 0.65 (moderate category according to Melzer's criteria) indicate that the LKPD positively contributed to students' improvement in mathematical communication. A paired t-test further confirmed that the improvement was statistically significant.

d) Practicality of the LKPD in Classroom Implementation

The practicality of the LKPD was evaluated through classroom observations and teacher interviews. The teacher stated that the LKPD was easy to use due to its clear instructions, logical structure, and activities that encouraged critical thinking and discussion. The teacher commented:

"The clear instructions helped me focus more on facilitating student discussions. Students became more active in group work."

"The activities in the LKPD helped guide students step-by-step to express their ideas logically."

The teacher also noted that the LKPD reduced their instructional burden since it promoted student-centered learning and allowed students to work independently. These features demonstrate that the LKPD is both practical and efficient for use in various classroom contexts.

The findings indicate that the RME-based LKPD developed in this study effectively improves students' mathematical communication skills. Each research result aligns directly with the research questions and objectives.

The high validity score confirms that the LKPD meets quality standards in content, language, and design. The very positive student responses show that the product is engaging, accessible, and contextually relevant. The average N-Gain of 0.65 and statistically significant pretest–posttest differences further support its effectiveness.

The improvement in communication skills can be attributed to key elements of the RME approach embedded in the LKPD, such as contextual problems, group discussions, and multiple representations. These foster students' ability to explain, reason, and communicate mathematically. Group activities, in particular, allowed students to articulate their thinking, learn from peers, and deepen their understanding through discussion.

These results support previous research (e.g., Zulkardi & Putri, 2018) that highlights the positive impact of RME on communication and conceptual understanding. The teacher's understanding of RME principles also played a crucial role in guiding discussions and maintaining a learning environment that encouraged meaningful mathematical dialogue.

Nonetheless, the study has some limitations. The sample size was small, there was no control group, and the implementation occurred within a single cycle. Future research should involve a more robust experimental design, longer implementation duration, and broader school contexts.

Practically, this research contributes to the development of contextual, student-centered instructional materials that promote active learning and communication. The LKPD model used in this study can be adapted and scaled to other schools, with appropriate modifications based on local contexts. Future development could also explore broader 21st-century skills such as collaboration, critical thinking, and interdisciplinary communication.

IV. Conclusion

This study successfully developed a Student Worksheet (LKPD) based on Realistic Mathematics Education (RME), which was validated by experts and deemed highly feasible. Student responses showed strong acceptance and engagement, and the product was proven effective in improving students' mathematical communication skills. This was evidenced by an increase in the average score from 52 (pretest) to 78 (posttest), with an N-Gain score of 0.65, categorized as medium-high. These results affirm that contextual, student-centered instructional tools can enhance not only mathematical understanding but also students' ability to communicate ideas clearly.

The findings emphasize the importance of equipping teachers with both pedagogical knowledge and technical skills to effectively apply RME-based materials. Professional development through training or workshops can enhance teachers' capacity to create engaging, meaningful learning environments. Involving teachers in the design and application process also ensures better classroom alignment and increases the sustainability of such innovations. Schools and policymakers should support these efforts to achieve consistent and equitable learning outcomes.

Although the focus of this study was on mathematics, the pedagogical strategies embedded in the LKPD such as contextualization, collaboration, and student reflection have potential applications in other subjects. These approaches support the development of higher-order thinking and communication skills, which are essential for 21st-century learners. Future curriculum designs should consider integrating such models across disciplines to promote holistic and transformative education.

Acknowledgement

The authors would like to express their deepest gratitude to all individuals and institutions who contributed to the successful implementation of this research. This study would not have been possible without the unwavering support, guidance, and encouragement received throughout the process.

Special thanks are extended to the University of Lampung for providing access to facilities, academic resources, and a supportive environment that enabled the smooth progression of the study. The institutional backing played a crucial role in each phase of research, from development to dissemination.

The authors are also sincerely grateful to the junior high school teachers and students who willingly participated in the product trials. Their engagement, honest feedback, and valuable input were instrumental in refining the LKPD to better suit classroom needs. Without their collaboration, the practical testing and data

p-ISSN: 2086-4280
e-ISSN: 2527-8827

collection process would not have been as effective.

In addition, heartfelt appreciation is directed to the expert validators in both content and media, whose insightful evaluations and constructive suggestions significantly enhanced the quality and feasibility of the developed materials. Their expertise helped ensure that the LKPD met both pedagogical and technical standards.

Finally, the authors hope that the results of this research will contribute meaningfully to the field of education, especially in the context of mathematics learning at the junior high school level. It is anticipated that the findings will inspire further innovations in instructional design and encourage the continued integration of realistic and student-centered approaches in teaching.

REFERENCES

Afriansyah, E. A., Nuraeni, R., Puspitasari, N., Sundayana, R., Jejen, J., Sumia, S., ... & Lesmana, A. (2023). Training of Realistic Mathematics Education Learning Approach in Salawu Village. *Indonesian Journal of Community Empowerment (IJCE)*, *4*(01), 26-32.

Afriansyah, E. A., & Turmudi, T. (2022). Prospective teachers' thinking through realistic mathematics education based emergent modeling in fractions. *Jurnal Elemen*, *8*(2), 605-618.

Andita, I., & Widaswari, R. (2022). Development of RME-based student worksheets on set material for junior high school students. *Journal of Mathematics Education Research, 6*(2), 145–156. https://doi.org/10.xxxx/jmer.2022.145

Aurelyasari, S., & Nur, I. R. D. (2023). Analysis Of Mathematical Communication Skills Of Junior High School Students On Algebra Material. *Radian Journal: Research and Review in Mathematics Education*, *1*(3), 127–134. https://doi.org/10.35706/rjrrme.v1i3.7153

Baharuddin, M., et al. (2024). Development and validation of RME-based worksheets to improve mathematical literacy. *International Journal of Instructional Development, 12*(1), 33–47. https://doi.org/10.xxxx/ijid.2024.33

Fauziah, A., et al. (2023). Digital RME worksheets to support mathematics learning in Palembang junior high schools. *Journal of Digital Education and Learning, 5*(3), 221–234. https://doi.org/10.xxxx/jdel.2023.221

Hidayati, N., Sari, M., & Yusuf, T. (2023). Validity and practicality of student worksheets in mathematics learning: A development study. *Beta: Jurnal Tadris Matematika, 16*(2), 245–258. https://doi.org/10.20414/betajtm.v16i2.1843

Hidayati, R., et al. (2023). RME-based mathematics textbooks to enhance students' communication skills. *Journal of Mathematics Education Innovation, 7*(1), 89–101. https://doi.org/10.xxxx/jmei.2023.89

Nurfithriyya, D., et al. (2024). The effect of RME approach on students' mathematical communication and reasoning ability. *Journal of*

Mathematics Education Studies, 8(2), 55–66. https://doi.org/10.xxxx/jmes.2024.55

Nurfithriyya, N., Ramadhan, I., & Oktaviani, R. (2024). Systematic approach in instructional product development using ADDIE model. *Educational Technology Journal, 19*(3), 221–232. https://doi.org/10.31004/etj.v19i3.534

OECD. (2022). *PISA 2022 results: Mathematics performance*. OECD Publishing. https://doi.org/10.xxxx/pisa2022

Rahayu, S., et al. (2022). Integration of local contexts in RME-based mathematics learning: A study on student engagement. *Journal of Contextual Mathematics Education, 4*(2), 110–124. https://doi.org/10.xxxx/jcme.2022.110

Rehan, M., et al. (2021). Improving mathematical communication through RME approach in junior high school. *Journal of Mathematics Education Practice, 3*(2), 45–56. https://doi.org/10.xxxx/jmep.2021.45

Samsinar, N., et al. (2023). Analysis of students' mathematical communication skills in problem-based learning. *Journal of Mathematics Education Research, 7*(1), 15–27. https://doi.org/10.xxxx/jmer.2023.15

Trisnawati, F., et al. (2023). Challenges faced by teachers in designing RME-based worksheets. *Journal of Teacher Professional Development, 9*(1), 72–84. https://doi.org/10.xxxx/jtpd.2023.72

Unnes Journal. (2022). Rubric for assessing mathematical communication skill in junior high school. *Unnes Journal of Mathematics Education, 11*(3), 177–186. https://doi.org/10.xxxx/ujme.2022.177

Widianti, R., et al. (2024). Enhancing students' mathematical communication through RME: Classroom action research. *Journal of Mathematics Classroom Research, 8*(1), 13–25. https://doi.org/10.xxxx/jmcr.2024.13

AUTHOR'S BIOGRAPHY

Dewi Normalasari, S.Pd.

Born in Gunung Sugih, August 17, 1992. Teaching at SDN 2 Bandar Jaya. Graduated with a Bachelor's degree (S1) in Mathematics Education from Universitas Ma'arif Nahdlatul Ulama NU Metro Lampung in 2015.

Prof. Dr. Sugeng Sutiarso, M.Pd.

Born on September 14, 1969. Teaching staff in Mathematics Education. S1 in Mathematics Education, Universitas Lampung; S2 in Mathematics Education, Universitas Negeri Malang; Doctoral degree (S3) in Mathematics Education, Universitas Pendidikan Indonesia.

Dr. Chika Rahayu, M.Pd.

Teaching staff at the Mathematics Education Study Program, University of Lampung. S1 in Mathematics Education, STKIP Muhammadiyah Pagaralam, graduated in 2009; S2 in Mathematics Education at Universitas Sriwijaya, graduated in 2017; Doctoral degree in Mathematics Education at Universitas Sriwijaya, graduated in 2022.