

Implementation of Realistic Mathematics Education (RME) in Geometry and Time Measurement Learning based on the Ramadhan Context in Grade III of Elementary School

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ABSTRACT

Mathematics learning in elementary school is often still abstract, which makes it difficult for students to understand concepts, particularly in geometry and time measurement. Therefore, a contextual and meaningful learning approach is needed, one of which is Realistic Mathematics Education (RME). This article aims to describe the implementation of the RME approach in teaching geometry and time measurement based on the Ramadhan context in Grade III of elementary school. This study uses a qualitative descriptive approach with data sources in the form of learning activity designs and relevant learning videos. Data collection techniques were conducted through observation, documentation, and analysis of learning conversation transcripts. The results of the study indicate that the use of the Ramadhan context, such as mosque decoration activities and the creation of an imsakiyah calendar, helps students understand geometry and time measurement concepts more concretely. In addition, the stages of RME learning, which include understanding contextual problems, exploration, formalization, application, and evaluation, encourage students' active involvement in the learning process. Thus, the RME approach based on the Ramadhan context can serve as an effective alternative to improve students' understanding of mathematical concepts in elementary school.

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INTRODUCTION

Mathematics learning in elementary school is often still perceived as abstract and less connected to students' real-life experiences (Hasibuan et al., 2025). This condition causes students to experience difficulties in understanding basic concepts, particularly in geometry and time measurement. In fact, at the elementary school level, students are in a cognitive development stage

that requires concrete experiences in order to build meaningful understanding. Therefore, a learning approach is needed that is able to connect mathematical concepts with students' daily lives (Leviana et al., 2025).

One approach that can be used is Realistic Mathematics Education (RME), which emphasizes the use of real contexts as the starting point of mathematics learning (Simanjuntak et al., 2025). Through this approach, students are not directly given formal concepts, but are guided to understand concepts through situations that are close to their lives (Anwar et al., 2024). In this context, mathematics learning becomes more meaningful because students can see the relationship between the material being studied and the reality they experience.

The month of Ramadhan is one of the contexts that is very close to students' lives, particularly in Indonesian society (Mala et al., 2025). Various activities carried out during Ramadhan, such as decorating mosques and following imsakiyah schedules, can be utilized as contextual learning resources. Mosque decoration activities, for example, can be used to introduce geometric shapes such as triangles, quadrilaterals, and circles, along with the properties of plane figures. Meanwhile, the use of an imsakiyah calendar can help students understand time measurement concepts, such as days and weeks, in a more concrete and applicable way.

Based on this, two RME-based learning activities were designed using the Ramadhan context, namely geometry learning through mosque decoration activities and time measurement learning through the creation of an imsakiyah calendar. In the first activity, students are invited to identify geometric shapes found in mosque decorations, then apply them in creating simple decorative designs. In the second activity, students learn to read and construct an imsakiyah calendar as a form of applying time measurement concepts in daily life during the month of Ramadhan.

Both activities are designed through the stages of RME learning, namely understanding contextual problems, exploration, formalization, application, and evaluation. Through these stages, students are expected to build conceptual understanding gradually, starting from concrete experiences toward formal understanding. In addition, students' active involvement in learning activities is also expected to increase their motivation and creativity in learning mathematics.

Based on the description above, the research questions in this article are: (1) how the RME approach is implemented in geometry learning through the context of mosque decoration during the month of Ramadhan, and (2) how the RME approach is implemented in time measurement

learning through the creation of an imsakiyah calendar. The purpose of this article is to describe the implementation of the RME approach in both topics and to analyze the relationship between the Ramadhan context and students' understanding of mathematical concepts.

METHOD

This study employs a qualitative descriptive approach that aims to describe the implementation of Realistic Mathematics Education (RME) in teaching geometry and time measurement based on the Ramadhan context in Grade III of elementary school. This approach is selected because the study focuses on understanding the learning process, the interactions that occur, as well as the relationship between the context used and the mathematical concepts being learned. Through this approach, the researcher can provide an in-depth description of how the stages of learning take place and how students construct conceptual understanding through contextual learning experiences.

The data sources in this study consist of several main components. First, learning activity designs that include geometry learning with the context of mosque decoration and time measurement learning with the context of the imsakiyah calendar. Second, learning videos used as supporting data to observe the implementation of classroom learning, which can be accessed through the link <https://youtu.be/EFTEWFkmUCA?feature=shared>. Third, transcripts of learning conversations used to analyze interactions between teachers and students during the learning process, particularly within the stages of RME-based learning.

Data collection techniques are carried out through observation, documentation, and transcript analysis. Observation is conducted on the learning videos to identify learning stages that align with the RME approach and to examine how the teacher presents the Ramadhan context in the learning process. Documentation in the form of learning activity designs is used to understand the structure and sequence of learning activities designed based on RME principles. Transcript analysis is conducted to examine interactions between teachers and students, particularly in the processes of understanding problems, conducting exploration, and gradually constructing mathematical concepts.

Data analysis techniques are conducted descriptively through several stages, namely data reduction, data presentation, and conclusion drawing. At the data reduction stage, data obtained from learning designs, videos, and transcripts are selected and focused on parts relevant to the

implementation of the RME approach. Subsequently, the reduced data are presented in the form of descriptive explanations organized according to the stages of RME learning, namely understanding contextual problems, exploration, formalization, application, and evaluation. The final stage is conclusion drawing, where the analyzed data are used to determine the effectiveness of using the Ramadhan context in helping students understand geometry and time measurement concepts through the RME approach.

The focus of this study includes three main aspects, namely the implementation of the RME approach in geometry learning through the context of mosque decoration, the implementation of the RME approach in time measurement learning through the creation of an imsakiyah calendar, and the interaction between teachers and students in the Ramadhan context-based learning process. This focus serves as the basis for analyzing the data and structuring the discussion to remain aligned with the research objectives.

RESULTS

This section presents the findings of the study regarding the implementation of the Realistic Mathematics Education (RME) approach based on the Ramadhan context in elementary mathematics learning. The results describe the learning process, student and teacher activities, and learning interactions observed during geometry.

A. Implementation of RME in Geometry Learning with the Context of Mosque Decoration

The implementation of the Realistic Mathematics Education (RME) approach in geometry learning in this study begins with the use of the Ramadhan context, namely mosque decoration activities. At the stage of understanding contextual problems, the teacher connects the lesson with students' real-life experiences through stories about mosque decoration activities before the month of Ramadhan, such as installing lights, making ketupat ornaments, and hanging star and crescent-shaped decorations. Through guiding questions such as "what decorations can be made?" and "what shapes are found in these decorations?", students are gradually directed to identify geometric shapes naturally. This stage shows that learning begins from a context close to students' lives, which helps build more meaningful initial understanding (Hamid et al., 2024).



Figure 1. Implementation of RME in geometry learning with the context of mosque decoration

At the exploration stage, students are invited to observe various images of mosque decorations prepared by the teacher. In this activity, students actively identify geometric shapes such as triangles, quadrilaterals, and circles found in these objects. The exploration process is reinforced through activities of creating geometric shapes using colored paper, scissors, and glue. Through this activity, students not only recognize shapes visually but also directly experience the process of forming plane figures. In addition, students are guided to identify the properties of plane figures, such as the number of sides and angles, through questions provided by the teacher. This exploration stage reflects the principles of RME, where students are given opportunities to construct knowledge through concrete experiences and direct activities (Rahman et al., 2025).

The next stage is concept formalization, where the teacher begins to guide students toward a more structured mathematical understanding. After students conduct exploration and produce various geometric shapes, the teacher collects students' work as material for class discussion. The teacher then re-explains basic geometry concepts, such as the definitions of triangles, quadrilaterals, and circles, by referring to students' work. Thus, the formalization process is not carried out directly at the beginning of learning, but is built from students' prior experiences (Syawal et al., 2026). This shows a process of mathematization from real contexts toward formal concepts, which is a key characteristic of the RME approach (Rahman et al., 2025).

At the application stage, students are given the opportunity to apply the concepts they have learned through activities of designing simple mosque decorations. Students use drawing paper, pencils, and rulers to create designs that incorporate various geometric shapes, then add cut-out shapes that have been made previously. This activity not only trains students' understanding of geometry concepts but also develops their creativity and motor skills. Through this application, students can directly see how mathematical concepts are used in real situations, making learning more meaningful and connected to daily life.

The final stage in this learning process is evaluation, which is conducted through an exhibition of students' work and joint reflection. The teacher assesses students' understanding based on their ability to identify geometric shapes and their properties, as well as their creativity in designing decorations. Reflection activities also provide students with the opportunity to express their learning experiences, including impressions and understanding gained during the learning process (Sakung et al., 2024). Overall, the implementation of RME in geometry learning with the context of mosque decoration shows that the use of contexts close to students' lives can enhance engagement and conceptual understanding in a more concrete way, while also reflecting the application of the main principles of RME in the learning process (Landong et al., 2025).

B. Implementation of RME in Time Measurement Learning with the Context of the Imsakiyah Calendar

The implementation of the Realistic Mathematics Education (RME) approach in time measurement learning begins with the use of the Ramadhan context through the imsakiyah calendar. At the stage of understanding contextual problems, the teacher connects the lesson with students' real needs in performing fasting practices, namely knowing the times of imsak, dawn, and maghrib. The teacher introduces the problem through guiding questions about the importance of the imsakiyah schedule and invites students to consider creating a simple imsakiyah calendar to be used together. This stage shows that learning begins from a situation that is relevant and meaningful to students, which makes it easier for them to understand the concept of time as part of daily life (Nuriana and Hotimah, 2023).

At the exploration stage, students are invited to observe and read examples of imsakiyah calendars provided. Students identify information contained in the calendar, such as dates, days, and important times during Ramadhan. The activity is followed by sketching a calendar and independently filling in the information with guidance from the teacher. Through this process,

students not only learn to read a calendar but also understand basic concepts of time measurement, such as the relationship between days and weeks. This stage reflects the principles of RME, where students construct understanding through contextual activities and direct experiences (Mangundap et al., 2025).



Figure 2. Student presentation activity

The stages of formalization and application are carried out in an integrated manner through presentation activities and the complete creation of an imsakiyah calendar. The teacher provides explanations regarding the concept of time, the function of calendars, and the importance of following schedules during Ramadhan, then students apply this understanding by organizing a neat and informative imsakiyah calendar. The activity concludes with evaluation through an exhibition of student work and reflection on the learning process. Overall, the use of the imsakiyah calendar context in time measurement learning shows that the RME approach helps students understand the concept of time in a concrete, applicable, and relevant way to their daily lives (Fitriani et al., 2025).

DISCUSSION

This section discusses the findings of the study by relating them to the principles of Realistic Mathematics Education (RME). The discussion focuses on the meaning of the findings, the role of

contextual learning in supporting student's understanding of implementing the Ramadhan based RME approach in mathematics learning.

A. Analysis of Learning Conversations

Based on the designed learning activities, the conversations between the teacher and students show interactions that support the implementation of the Realistic Mathematics Education (RME) approach (Ratnawati et al., 2025). The conversation data in this study are derived from the reconstruction of learning activities traced through a learning video uploaded on YouTube by the creator Fitria Aristasari. The use of video as a data source aligns with qualitative research practices that utilize audiovisual media to analyze learning interactions in a more contextual manner (Nurjaman et al., 2024). Learning videos have been widely used as data sources in educational studies because they are able to represent learning processes in a real and dynamic way (Nafi' and Anshori, 2025).

At the stage of understanding contextual problems, the teacher begins the lesson by connecting students' experiences with the Ramadhan context, particularly mosque decoration activities. The teacher explains that the class will soon welcome the month of Ramadhan and expresses the intention to make the mosque more beautiful with decorations, then asks students what kinds of decorations can be created. Students respond by mentioning lamps, ketupat ornaments, stars, and crescent shapes. The teacher then asks about the shapes found in those decorations, and students answer that there are triangles, circles, and quadrilaterals. This interaction shows that the teacher acts as a facilitator who stimulates students' prior knowledge through open-ended questions (Dwijantie and Nurishlah, 2025). Students respond actively and begin to connect real objects with geometric concepts, reflecting the principle of guided reinvention in which students are directed to rediscover mathematical concepts through their own experiences.

At the exploration stage, the interaction between teacher and students increasingly reflects the process of knowledge construction. The teacher does not directly provide answers but guides students through questions that encourage critical thinking. The teacher asks about the shape found in a hanging lamp, and students identify it as a circle. The teacher then asks about the number of sides in a ketupat shape, and students respond that it has four sides. The teacher continues by asking whether all sides of a triangle are always equal in length, and students respond that this is not always the case. This conversation shows that students begin to understand the properties of plane figures through observation and reflection. The teacher functions as a guide who helps students

clarify their understanding, and the interaction demonstrates that learning is dialogical and allows students to actively construct concepts gradually (Kusnandar and Muslimah, 2025).

At the formalization stage, the learning conversation begins to lead toward the formation of more systematic mathematical concepts. The teacher reinforces the results of students' exploration by presenting formal definitions that are built from prior learning experiences (Nababan and Nababan, 2025). This process reflects vertical mathematization, which is the transition from informal understanding to formal concepts. In time measurement learning with the *imsakiah* calendar context, a similar interaction pattern is observed, where the teacher begins with contextual questions and then guides students to read, understand, and construct the calendar independently.

Overall, the analysis of learning conversations shows that the interaction between teacher and students reflects the main principles of RME, including the use of real contexts, active student participation, and the role of the teacher as a facilitator (Musyadad et al., 2025). The presence of learning video sources as empirical data strengthens the validity of the analysis, as it allows direct observation of classroom interaction dynamics. Thus, learning conversations are not only part of the communication process but also serve as an important indicator in assessing the success of implementing RME based on the Ramadhan context.

B. General Discussion of the Implementation of RME Based on the Ramadhan Context

The results of the study show that the implementation of the Realistic Mathematics Education (RME) approach through the Ramadhan context, both in geometry learning and time measurement, is able to create a more meaningful learning process for students. In geometry learning, the use of the mosque decoration context provides concrete experiences that help students recognize plane shapes and their properties. In time measurement learning, the *imsakiah* calendar context enables students to understand the concept of time in an applicable way through activities that are close to their daily lives. These findings confirm that learning that starts from real contexts can increase student engagement and facilitate the understanding of mathematical concepts (Nurhaswinda et al., 2025).

When linked to RME theory, the implementation carried out reflects the main principles proposed by Hans Freudenthal, namely that mathematics should be viewed as a human activity, mathematics as human activity (Mangundap et al., 2025). This is evident in how students do not merely receive information passively, but actively engage in discovering concepts through

exploratory activities. The principle of guided reinvention is seen in the process where students are directed to identify geometric shapes from mosque decorations and understand the concept of time through the imsakiyah calendar. In addition, the principle of didactical phenomenology is reflected in the selection of the Ramadhan context that is relevant to students' lives, while the principle of self-developed models is evident in students' work in the form of decoration designs and calendars that they create themselves.

Further analysis of learning interactions through teacher and student conversations shows that the role of the teacher in the RME approach is no longer as the center of information, but as a facilitator who guides students' thinking processes (Nurwahid et al., 2025). The teacher uses open-ended questions to stimulate students' thinking, which creates dialogical and participatory learning. This aligns with the concept of contextual learning that emphasizes the importance of students' active involvement in constructing knowledge. Learning therefore does not only focus on final outcomes, but also on the thinking processes students undergo in understanding mathematical concepts.

Despite these strengths, the implementation of the RME approach based on the Ramadhan context also has several limitations. Learning with this approach requires relatively more time compared to conventional methods, because students need to go through stages of exploration and gradual concept discovery. The success of the learning process also highly depends on the teacher's ability to design relevant contexts and manage the classroom effectively (Siregar et al., 2025). Without careful planning, the learning process may become less directed. Therefore, teacher readiness is required both in terms of pedagogical competence and creativity in developing context-based learning.

Overall, the results of this study indicate that the RME approach utilizing the Ramadhan context can serve as an effective alternative in mathematics learning in elementary school. Learning that connects mathematical concepts with students' real-life experiences not only improves conceptual understanding but also fosters interest and motivation in learning. Integration between the RME approach and everyday life contexts, such as Ramadhan, can provide a positive contribution to creating mathematics learning that is more contextual, meaningful, and relevant for students.

CONCLUSION

Based on the results and discussion presented, it can be concluded that the implementation of the Realistic Mathematics Education (RME) approach in mathematics learning based on the Ramadhan context in Grade III of elementary school is able to create more contextual and meaningful learning. In geometry learning, the use of the mosque decoration context has been proven to help students recognize plane shapes such as triangles, quadrilaterals, and circles, as well as understand their properties through direct experience. In time measurement learning, the imsakiyah calendar context allows students to understand the concepts of days and weeks more concretely through activities of reading and constructing calendars that are relevant to their lives during the month of Ramadhan.

The implementation of the stages in the RME approach, which include understanding contextual problems, exploration, formalization, application, and evaluation, provides students with opportunities to build conceptual understanding gradually. Students do not merely receive information passively, but actively participate in the learning process through observing, discussing, and producing work. In addition, the dialogical interaction between teacher and students supports the process of guided reinvention, allowing students to discover mathematical concepts based on their own experiences.

Despite the positive results, several aspects need to be considered in its implementation, such as the need for more time and the importance of teacher readiness in designing context-based learning. It is therefore recommended that teachers develop creativity in selecting relevant contexts and manage learning effectively. The RME approach based on everyday life contexts, including Ramadhan, can become an appropriate alternative to improve the quality of mathematics learning in elementary schools.

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