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Integrating of the RME model based on ethnomathematics using Jember's traditional "Prol Tape" to enhance fraction understanding

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Abstract

Background: This research addresses the issue of mathematics learning, which is often perceived as difficult and unengaging. The use of monotonous teaching methods has led to boredom among students. By developing a Realistic Mathematics Education (RME) model based on the ethnomathematics of "prol tape", a traditional product from Jember, this study aims to make learning more enjoyable and engaging for students.
Aim: The aim of this study is to develop an RME learning model based on the ethnomathematics of "prol tape" to improve the understanding of fractions among grade 2 students at Madrasah Ibtidaiyah (MI).
Method: This study employs a Research and Development (R&D) approach using the 4-D model (Define, Design, Develop, Disseminate) proposed by Thiagarajan. The research was conducted at a school in East Java during the second semester of the 2023/2024 academic year, involving teachers and students. Data were collected through interviews, observations, and documentation.
Results: The findings indicate that the developed learning model is effective, with 86.36% of students achieving mastery. The average N-gain score of 0.77 indicates a high level of improvement in students' understanding of fractions. Students also responded positively to the model, noting that the cultural context of the "prol tape" stories made it easier for them to grasp the material.
Conclusion: This study provides valuable insights into the development of RME models that integrate local cultural elements. The findings highlight that culturally relevant teaching methods can significantly improve students' understanding of mathematical concepts and offer innovative strategies for enhancing mathematics education.

INTRODUCTION

Quality improvement is important during the learning process. As in one of the subjects taught at MI, namely Mathematics. In general, math lessons are considered unpleasant lessons for students. Often students do not pay attention to the teacher's explanation and this results in low student learning outcomes. This is explained by the class teacher in the interview that many children get low scores in math. This is due to their difficulty in understanding the material being taught, so they tend to talk to themselves when learning takes place. Many teachers think that students do not understand mathematical concepts,

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resulting in many mistakes in working on problems (Lapase, 2021). One of the factors that cause this problem is the low cognitive ability of students. When students have difficulty in thinking critically and logically, it is important to take into account their level of cognitive ability (Verschaffel et al., 1994).

Mathematics, as a field of science that has a universal scope, plays an important role in the advancement of modern technology. Mathematics education also has an important role both in the context of education and everyday life, because mathematics is the basic basis for various calculation activities that humans carry out every day (Irdawati et al., 2019). The same thing that mathematics is needed and useful in everyday life, for science, trade, and industry, and because mathematics provides power, a means of communication that is brief and clear and serves as a tool to describe and predict in a critical way of thinking (Irdawati et al., 2019).

Mathematics is a tool of thought, communication, logic, and intuition, which includes arithmetic, algebra, geometry, and analysis. Its characteristics include deductive, logical, abstract, and symbolic (Fantuzzo et al., 2011; Tanujaya et al., 2017). The study of mathematics starts with basic concepts such as whole numbers and fractions, then progresses to more complex concepts such as differential and integral (Henschel & Roick, 2017). Fraction material given to students in the process is often presented abstractly, so students have difficulty understanding the concept of fractions and operations related to fractions (Cendekiawaty & Sugiman, (2020); Rohmah, 2019). Fractions are often considered more difficult to understand than whole numbers (Kania, 2018). This difficulty arises because the understanding of the concept of fractions is still weak (Cahyani et al., 2019; Fauziah et al., 2021). As a result, students have the potential to experience misconceptions when learning fractions.

The solution that can be offered to deal with this problem is an approach that can be used in learning mathematics that is related to everyday life, one of which is RME. According to Uskono, Djong, & Leton (2020), realistic mathematics teaching aims to provide problems that are relevant to students' daily lives. Realistic mathematics education uses real-world situations as a foundation for developing mathematical ideas and concepts so that students can actively engage in meaningful learning under the direction of the teacher.

The RME approach has characteristics that use real contexts as a starting point for learning. In RME, the use of real contexts aims to facilitate students' understanding of mathematical concepts by abstracting them from non-formal to formal forms (Hadi, 2017; Soedjadi, 2014). The real context can be implemented by linking culture with learning. In science, studies that link culture and mathematics are called Ethnomathematics. Ethnomathematics is an approach used to explain the real connection between culture, environment, and mathematics as a branch of science. Culture-based mathematics learning is an approach that is expected to be an innovative option in learning development, where the development is tailored to the local wisdom of a particular school. Thus, it is expected to improve student learning achievement (Astutiningtyas et al., 2017).

This is as revealed (Risdiyanti & Prahmana, 2021) that Ethnomathematics can be part of the RME approach, especially when using authentic contexts as a starting point in the learning process. Thus, students can gain an understanding of a mathematical concept that is implicitly contained in the culture. Through the application of RME with real contexts such as culture and daily life, students' views on mathematics which were originally considered scary and separate from everyday life can be minimized (Zulkardi et al., 2020). Moreover, with the real context used in RME, students can critically understand the meaning of the mathematics they learn, as well as feel its benefits in solving problems faced in everyday life (Hadi, 2017; Risdiyanti & Prahmana, 2021).

The facts on the ground show that teachers rarely relate math to local culture. According to Rosa and Orey (2011), math is often taught in schools as a subject that is not related to everyday life. mathematics is deeply rooted in culture and develops naturally in society without formal education (Zayyadi, 2017). Many students have a negative perception of math because of its abstract and difficult concepts. This makes students' math skills low (Laurens et al., 2018). Therefore, teachers should use contextualized learning resources to bridge the gap between school and life reality (Pathuddin et al., 2019). There is also a view that mathematics taught in schools needs to be transformed into social mathematics, which means mathematics should be practiced and related to socio-cultural values (Dari & Jatmiko, 2024).

One of the media that can be utilized through the RME approach is local culture. The local culture used in this context is the local culture of the city of Jember. According to Agestin and Pakartiko (2019), Jember has a unique and distinctive batik motif, the tobacco leaf motif. The area is known as the largest center of tobacco production in Indonesia and is often referred to as the “city of tobacco”. In addition, Jember is also famous for its JFC (Jember Fashion Carnival). This event is held once a year. The city of Jember is also referred to as the city of Pandhalungan, which means a cultural fusion between the Javanese and Madurese tribes (Nieveen, 2020). The city also has distinctive food and drinks, including wedang cor (a blend of milk, ginger, and black sticky rice) and food derived from processed cassava known as “prol tape”.

Prol tape is made from cassava. This food is processed through various stages. Through this special food, it is hoped that students will be able to use it as a medium to understand fraction material and recall previous learning, namely units of weight. This is as Fruedental and D'Ambrosio think, that mathematical concepts arise from the way humans respond to the environment around them, especially when they seek explanations, understanding, and solutions to the various phenomena they face. Mathematics itself is influenced by various aspects of human life, such as history, environment, society, geography, and culture (Prahmana & Istiandaru, 2021). Thus, the development of mathematics does not only occur by itself but also as a result of complex interactions between humans and their environment. The opinion of Muhtadi et al. (2017) is also in line with this view, which emphasizes that mathematics has a close relationship with culture and human daily life, which is then represented in formal form.

One strategy to facilitate mathematical understanding for students is to connect mathematics learning with local wisdom in an area, known as the ethnomathematics approach (Haikal et al., 2023). Ethnomathematics is an approach that combines cultural aspects with mathematics, the aim is to increase students' love for culture and show the various benefits of mathematics from a cultural point of view (Astuti, 2018).

D'Ambrosio (1985) developed the ethnomathematics approach as a solution to reduce the gap between formal mathematics and students' daily lives. Ethnomathematics is a method to understand and incorporate ideas, methods, and techniques used and developed by socio-cultural groups within a community to learn mathematical concepts (D'Ambrosio, 2016; Delcourt & Delcourt, 1987). The purpose of this approach is to reconstruct mathematics so that it can be reunited with its diverse cultural roots. With the ethnomathematics approach, students can appreciate various mathematical methods, ideas, and techniques that come from various cultural groups (D'Ambrosio, 1985). This approach can foster a critical, democratic, and tolerant attitude towards various ideas that arise during the learning process, both inside and outside the school environment (D'Ambrosio, 1985; Risdiyanti & Prahmana, 2021). Thus, ethnomathematics is considered an innovation in learning that can increase students' interest in mathematics, motivate them to learn, and encourage creativity through recognition and appreciation of the culture owned by students.

This study aims to highlight the local culture of Jember, particularly its traditional food, as a medium for teaching the concept of fractions in mathematics. Unlike previous research, such as that by Pathuddin et al. (2019) and Muhtadi et al. (2017), which used Bugis and Sundanese cultures to explain geometric and measurement concepts in mathematics, this study focuses on utilizing Jember's traditional food as the context for teaching fractions. This represents a novelty that has not been explored, particularly in the context of teaching fractions at the Madrasah Ibtidaiyah (MI) level. Meanwhile, Uskono et al. (2020) has explored the use of an ethnomathematics-based RME approach, but not specifically using traditional food as a learning medium in the context of fractions.

This research introduces an ethnomathematics-based RME approach that uses Jember's traditional food as a relevant learning resource for MI students. It not only focuses on developing mathematical skills but also aims to strengthen students' sense of cultural identity and appreciation for the local richness surrounding them. This approach offers a contextual, enjoyable, and culturally grounded learning experience, which has not yet been implemented at the elementary level using Jember's traditional food as teaching material in mathematics. Therefore, the objective of this study is to develop an ethnomathematics-based RME learning model, "Prol Tape," to enhance the understanding of fractions among Madrasah Ibtidaiyah (MI) students.

METHODS

Design:

This research is a type of Research and Development (R&D) development research. According to Sugiyono (2017), development research is a research method intended to create a product and assess its success through expert evaluation in the validation process. The development model used in this research is the RME learning model with the 4-D development model by Thiagarajan (in Lawhon, 1976). The 4-D model consists of four stages: Define, Design, Develop, and Disseminate as illustrated in Figure 1.

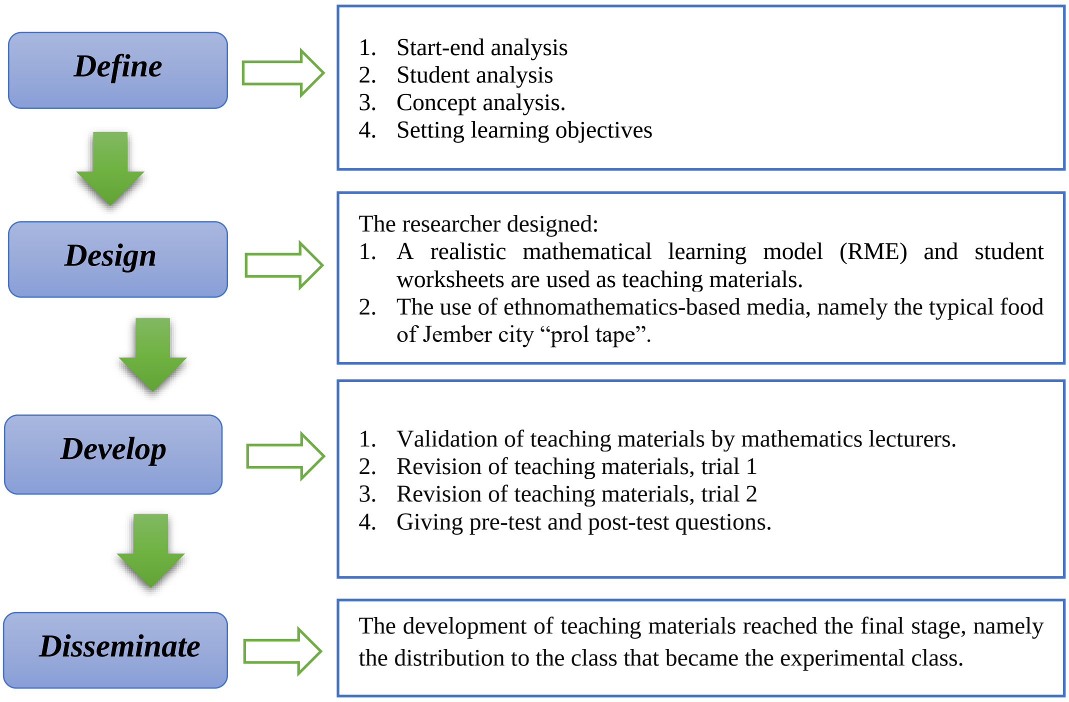

Figure 1. 4D development model

Participants:

This research was conducted at Madrasah Ibtidaiyah in Jember area in the even semester of the 2023/2024 academic year. The research respondents consisted of grade 2 teachers and 22 grade 2 students. Participants were selected to assess the feasibility and effectiveness of the RME learning model developed in this study.

Instruments:

The research instruments used in this study include:

1. Learning product validation guidelines: This included components such as supporting theory, model syntax, social system, reaction principle, support system, and instructional and accompanying impacts.
2. Test of the ability to understand fraction concepts: The instrument was designed with indicators such as restating a concept, presenting concepts in various forms of mathematical representation, and applying concepts or problem-solving algorithms.
3. Guidelines for practicality: This contained indicators such as students' feelings toward the learning process, the novelty of the product, and students' interest in participating in learning using the developed product.

Data Collection:

Data collection in this research was carried out using multiple techniques, including interviews, observations, documentation, tests, and questionnaires. Interviews were conducted to gain insights into student characteristics and classroom conditions, providing a deeper understanding of the learning environment. Observations were used to monitor the implementation of the developed teaching materials and to evaluate how well the learning activities aligned with the objectives of the research. Documentation was collected to capture detailed information about the learning process and classroom dynamics. Tests were administered to assess students' understanding of fraction concepts, measuring their ability to restate concepts, present them in various mathematical representations, and apply problem-solving algorithms. Finally, questionnaires were distributed to both teachers and students to gather feedback on their experiences with the ethnomathematics-based RME learning model, focusing on their perceptions of its practicality, novelty, and overall effectiveness in enhancing the learning process.

***Data Analysis*:**

Expert validation of the learning materials was conducted to ensure content and construct validity using a validation sheet. The validity of each aspect of the RME learning model was determined based on Ratumanan and Laurens (2006) validation criteria listed in Table 1.

Tabel 1. Criteria for Assessing the Validity of the RME Model based on Ethnomathematics

Score Interval (x)	Assessment Category	Description
$x \geq 3{,}00$	Very valid / very feasible	Can be used without revision
$2{,}50 \leq x < 3{,}00$	Valid / feasible	Can be used with minor revisions
$2{,}00 \leq x < 2{,}50$	Less valid/less feasible	Can be used with many revisions
$x < 2{,}00$	Invalid/not feasible	Unusable

Furthermore, the development trial was carried out by testing the practicality of the product developed, namely the learning design with the ethnomathematics-based RME model. This practicality test involves (1) an assessment of product practicality by experts and (2) the level of teacher response after implementing learning using the ethnomathematics-based RME model. The criteria for practicality can be seen in Table 2.

Table 2. Criteria for Practicality of RME Model based on ethnomathematics

Interval Score	Practicality Criteria
$X > 85$	Very Practical
$70 < x \leq 85$	Practical
$X \leq 70$	Not practical

The dissemination stage is the stage where the final product that has been developed is declared valid, effective and suitable for use by the target product. To test the effectiveness of the product developed in the form of an ethnomathematics-based RME learning model design, this was done by analyzing the test scores on the ability to understand the concept of fractions after learning. The product effectiveness indicator determined is that a minimum of 80% of all students who take the learning outcomes test related to the concept of fractions get a score based on the Minimum Completeness Criteria (MMC) standard. Meanwhile, to test the potential effect of the product that has been developed in improving students' ability to understand concepts, it is done by calculating the N-Gain score using the formula introduced by Hake (1998):

$$\text{N-Gain} = \frac{posttest\ score - pretest\ score}{ideal\ score - pretest\ score}$$

Furthermore, the results of calculating the N-Gain value can be determined based on the N gain value or from the N-gain value in the form of percent (%). We can see the distribution of N-gain value categories in Table 3.

Tabel 3. Division of gain score

Standart Gain Score (g)	Criteria
g > 0.7	High
0,3 ≤ g ≤ 0.7	Medium
g < 0.3	Law

Meanwhile, the division of the N-gain category in the form of percent (%) can refer to Table 4.

Table 4. N-gain effectiveness interpretation category

Percentage (%)	Interpretation
< 40	Ineffective
40 - 55	Less effective
56 -75	Effective enough
> 76	Effective

RESULTS AND DISCUSSION

a. Define

At this stage, the researcher conducts a beginning-end analysis, student analysis, concept analysis, and specification of learning objectives as a basis for developing the product. Data collection at this stage is done by interview method conducted with the head of the class who is also the mathematics teacher. In addition, the method is done by giving a questionnaire to students, which includes their feelings in participating in mathematics learning. The results of the interview concluded that (1) The method of learning mathematics that has been taught in the classroom is limited to lectures, discussions, and assignments. This makes students feel bored while participating in learning and less understanding of teacher's explanation (2) It is not like what most students say that mathematics is difficult and makes them dizzy. Sometimes there are even some students who choose not to go to school because they are afraid of mathematics classes (3) Teachers never include cultural elements in learning mathematics.

Students' analysis was conducted by observing their activities while participating in mathematics learning. The observation results showed that (1) students who actively participated in learning with a percentage of 50%. (2) students who did not pay attention to the teacher's explanation with a percentage of 25% and (3) students who were passive in learning with a percentage of 25%. In addition, the students were also analyzed by interviewing the class teacher about the media used. The results of the interview stated that the teacher used learning media objects around the classroom, never linking culture in mathematics learning.

Based on the data obtained, the researcher concluded that it is necessary to develop a learning method that links mathematical concepts with students' daily experiences. This can be done by linking local culture with math learning. As explained by Yanti et al., (2022) that linking surrounding culture can be a teacher's option to provide understanding to students, so that students can easily understand the material. This is because culture is one of the elements that is very close to students' daily lives.

b. Design

The product developed in the form of an ethnomathematics based RME model learning design is how the teacher is able to integrate culture with his pedagogical knowledge in teaching fraction concept material. The cultural aspect that is integrated is the typical food of the city of Jember.

RME is an approach that allows teachers to present contextual problems to the class as a first step in learning. RME also encourages students to actively participate in learning activities by challenging them to identify the concepts being taught. In addition, RME helps students learn individually or in groups. They are invited to work together to solve realistic contextual problems. RME is a solution to change the way students understand the material, connect new knowledge with what they already have, and build a stronger understanding (Gravemeijer et al., 2013; Sumirattana et al., 2017; Tanujaya et al., 2017).

RME model is one of the approaches to teaching mathematics that emphasizes students' abilities, both individually and in groups, by using real-world contexts and learning resources around them (Karlimah, 2024). Linking the surrounding culture can be a teacher's option to provide understanding to students so that students can easily understand the material. This is because culture is one of the elements that are very close to students' daily lives (Yanti et al., 2022). The use of ethnomathematics as a learning medium will provide a meaningful experience for the student's learning process. In addition, ethnomathematics also make it easier for students to understand mathematical concepts.

Understanding a science concept that is being studied is very important because it helps students develop to a higher cognitive level. When students have a good understanding of the concept, they can relate the concepts to each other. In addition, a deep understanding of the concept allows students to apply the concept in solving various problems, from simple to complex (Shoimah, 2020).

Some indicators of concept understanding in mathematics education as expressed by Jihad and Haris (2008) are restating the concepts learned in their own words, classifying objects based on properties that are consistent with the concepts learned, giving examples and non-examples of these concepts, presenting concepts in different forms of mathematical representation, using and selecting certain procedures or operations related to the concepts learned, applying concepts or algorithms in solving problems, developing necessary and sufficient conditions of a concept. The steps of the ethnomathematics-based RME learning model as found in Figure 2.

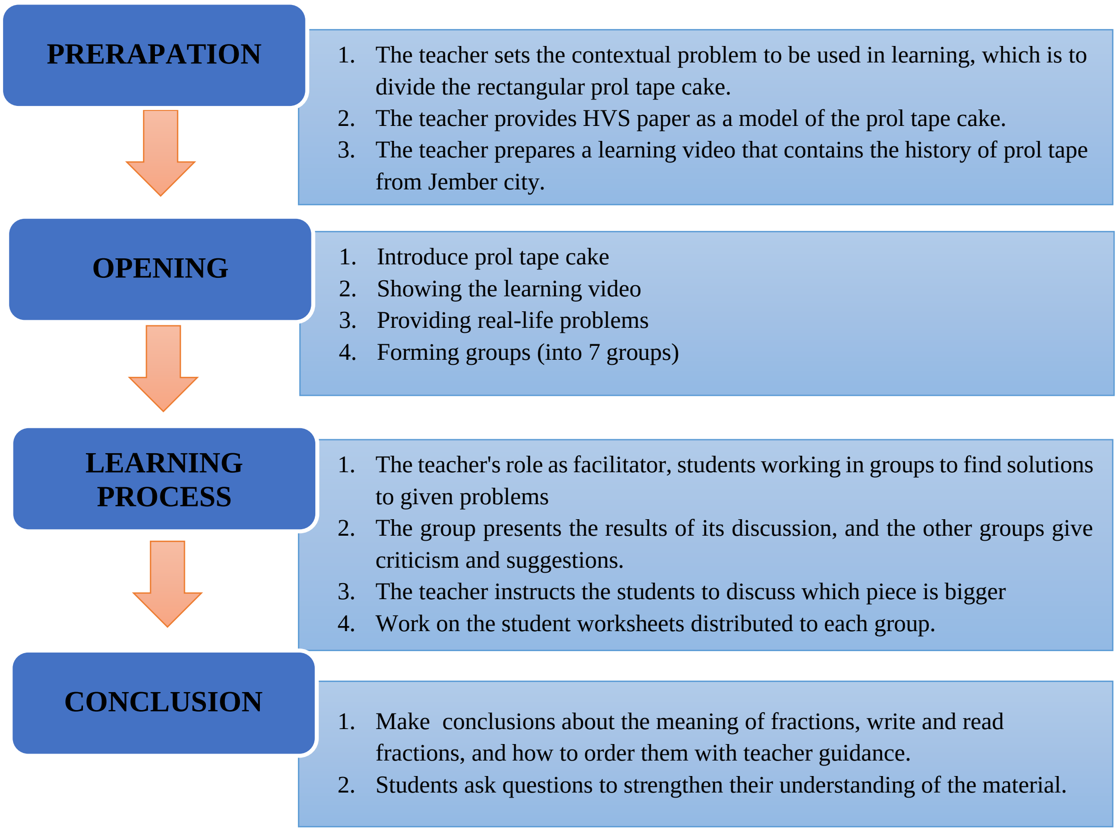

Figure 2. Steps of the RME learning model

In the preparation stage, the teacher determines the contextual problem that will be used for learning, namely, dividing a rectangular prol tape cake. The teacher provides HVS paper as a model of prol tape cake. The teacher prepares a learning video that contains the history of prol tape from Jember City.

In the opening stage, the teacher starts the lesson by showing the prol tape cake to the students and asking them about the cake. The teacher then shows a video about the production and history of prol tape as a typical food culture of Jember City. Prol tape itself is made from cassava. Cassava is fermented into tape, which produces a distinctive sweet and sour taste. It is then processed with the addition of eggs, sugar, and flour. Prol Tape is a favorite among the people of Jember with its different flavors such as chocolate, raisin, original, and cheese, each of which has its advantages. The origin of the name "prol" itself cannot be ascertained, but some people think that because the texture is very soft and crumbles easily in the mouth, this cake is called "prol", meaning that it immediately crumbles or falls off when eaten. Generally, prol is made with raisin and cheese toppings. The arrangement of raisins is neatly placed, making it easier for students to divide the prol cake into equal portions.

Next, the teacher tells the students that there is a mother who wants to divide the prol tape cake between her two children so that each child gets an equal share. How do you divide it? The teacher asks one student to come forward and practice dividing the cake using HVS paper as a model of the prol tape cake. The teacher explains how to write and read fractions on the board. The teacher asks the students a second question, "What if the mother wants to divide the prol tape cake among her 3 children? How do you divide it so that the 3 children get equal shares? And the third question, what if the mother wants to divide the cake among her 4 children? How can she divide it so that her 4 children get equal portions? Then the teacher divided the students into groups (3 groups worked on the second question, and 4 groups worked on the third question. And distributes the cake to each group. The teacher gives each group time to solve the problem in their own way. After the time is up, each group is given the opportunity to present the way they solved the problem, while the other groups give criticism and suggestions.

The teacher monitors the progress of the group activities in sharing the given cake, as shown in this picture.

Figure 3. Students take turns dividing "prol tape" cake

The teacher allows each group representative the opportunity to present their way of dividing the cake and other groups provide criticism and suggestions. The teacher instructs students to discuss which piece is bigger (a cake divided by 2, 3 or 4). The teacher instructs students to work on the worksheets distributed to each group. In the final phase, the teacher directs students to make inferences about the meaning of fractions, to write and read fractions, and to sort fractions with the teacher's guidance. Students ask questions to deepen their understanding of the material.

c. Develop

Product validation in the form of an ethnomathematics-based RME model learning design is validated by an expert using a validation sheet prepared with specified validity criteria. The validator suggested choosing a typical food that students can easily recognize. Based on this suggestion, the researcher used prol tape on the grounds that prol tape can be divided easily and is in accordance with the material to be taught, namely fractions. Furthermore, the validator also suggested that the language used in the student worksheet should be simple and direct examples should be added for each step that students should do. How students should divide the object and write the appropriate fraction.

The validation results are used to revise the developed products based on input and suggestions from experts. The validation results were used to make revisions to the developed product based on expert input and suggestions. Based on the suggestions and comments from the validators, researchers made some important changes in the initial design of the learning materials: (1) cultural context adjustment: the researcher added a cultural context that is closer to students' lives, such as the use of illustrations and stories involving traditional food, prol tape, which they often encounter. This is expected to increase students' understanding and engagement in learning fractions. (2) material simplification: the fraction material that was initially quite complex was simplified to make it easier for students to understand. For example, researchers reduced the number of steps in the problem, provided clearer instructions, and used more concrete visual aids to explain the concept of fractions.

As explained by Richey (2005), the method of validating learning models can be done with an approach that involves experts in education or related fields to assess and provide feedback on the effectiveness, accuracy, and suitability of the learning model created. This process ensures that the developed model meets quality standards and can be implemented properly in the desired educational context. The ethnomathematics-based RME learning model is said to be valid if it shows a need, novelty (state of the art), has a strong foundation, and there is consistency between model components (Abror et al., 2023, Makhrus, 2018; Nieveen, 1999). The results of model validation and reliability are briefly presented in Table 5.

Table 5. Validation and reliability results of the Ethnomathematics based RME model.

Component	Score Validity	Validity	Reliability Coefficient	Reliability
Supporting Theory	3,50	Completely valid	100,00%	Reliable
Model Syntax	3,50	Completely valid	100,00%	Reliable
Social System	2,50	Valid	87,76 %	Reliable
Reaction Principle	3,00	Valid	92,75%	Reliable
Support System	3,00	Valid	92,75%	Reliable
Instructional and Accompanying Effects	3,25	Completely valid	94,21%	Reliable

The calculation of the reliability coefficients listed in Table 4 shows that all model components have high reliability. This reliability coefficient is calculated based on the ratings of two expert validators. As a result, the reliability coefficient for the ethnomathematics-based RME learning model ranges from 92.75% to 100%. The lowest coefficient of 92.75% was obtained from the validation of the reaction principles component and the supporting system, while the highest coefficient was for the supporting theory component and the model syntax. All reliability coefficients of the ethnomathematics-based RME model components are above 75.00%, so the validator's assessment of all model components using the validation tool is considered reliable (Borich, 1994).

The validity results obtained indicate that product development can continue at the field trial stage. However, according to the experts, several components need to be revised, including 1) there is consistency between the model developed and the theory that underlies it, 2) the syntax of the ethnomathematics-based RME learning model is clarified in the form of tables or graphs, 3) aspects of formulating indicators, not only using the operational verb C2 (understanding) but can use C3 (applying) and C4 (analyzing) to measure the ability to understand the concept of fractions, 4) aspects of media selection, it is recommended to use a culture that is easily known to students, 5) aspects of language, it is recommended to use a language that is easily understood by students.

The practicality of the product in the form of a learning design for the ethnomathematics-based RME learning model that was developed was tested based on the practicality scores of experts as well as the implementation of learning using the ethnomathematics-based RME model carried out by teachers in teaching the concept of fractions using predetermined practicality criteria. Based on the data obtained from the observation sheets that were collected, both expert observation sheets and teacher responses, are presented in Table 6.

Table 6. Validation results of the developed products

Validator	Practicality Level	Categori
Expert	79	Practical
Teacher	81	Practical
Average	80	Practical

Based on the validation results from experts and the implementation of learning by mathematics teachers using the developed products, the validation results show that the ethnomathematics-based RME learning model is classified as practical. However, based on the results of observations in the learning process, several things need to be improved, including improvements in aspects (1) additional media in the form of learning videos need to be further shortened in duration, (2) the mastery of learning steps is still not fully mastered by the teacher, this is because the application of ethnomathematics-based RME tends to be new for teachers, (3) in concluding, it must involve students, (4) During the learning process, the teacher's role is only that of a facilitator.

d. Disseminate

Application of learning using ethnomathematics-based RME for 3 sessions. The effectiveness of the developed product, namely the ethnomathematics-based RME learning model design, can be seen from the pre-and post-test results regarding the student's ability to understand concepts in fraction material. The test was administered to 22 students of class 2D. The pretest and post-test scores on students' conceptual understanding of fractions material are shown in the following Table 7.

Table 7. Pre-test and Post-test Scores for Students' Reasoning Ability

Indicator	Average Score Understanding the concept of fractions			The number of students		Percentage Students complete
	Pre-test	Post-test	N-Gain	Complete	Not Completed	
Repetition of the concept	52.04	92.72	0.87	19	3	86.36
Mathematical representation	50.90	88.18	0.76			
Application of concepts	45.45	84.54	0.70			
Average score	49.46	88.48	0.77			

Based on Table 6 above, it can be seen that out of the 22 students of class II D MI Ar-Roudhoh who were given a test on students' ability to understand the concept of fractions, there were 19 students or 86.36% who got a test score ≥ KKM and only 3 students did not complete the test, namely those who got a test score < KKM. The three students mentioned had difficulty in understanding fractions of ½. They could not divide the prol tape cake into two equal parts. This difficulty occurs due to a lack of visual and spatial understanding. According to Piaget's developmental theory, children aged 7 to 12 years are in the concrete operational stage (Juwantara, 2019), where they begin to understand abstract concepts through real objects. If they are not familiar with concrete division activities, such as dividing a physical object into two equal parts, they may struggle to apply the concept in the form of drawings or symbols. Children need concrete experiences before they can understand abstract concepts such as fractions.

Furthermore, they also have difficulty connecting the concept of fractions with the cultural context used in the material. So far, they are more familiar with prol tape with a different and smaller shape than the one used in the lesson. This difficulty may be due to a lack of knowledge or experience with certain cultural objects. Although the cultural context used is local, it is possible that not all students have the same experience with the food used in the examples. According to Vygotsky's theory of social learning, children learn through interaction with their environment. If their environment does not often involve certain objects, they may not have strong mental schemas to process the information (Agustyaningrum et al., 2022)

It can be concluded that the percentage of students' learning completeness is 86.36%, which meets the minimum criteria of 80%. Thus, the developed product, namely ethnomathematics-based RME, is effective and suitable for use by students in the second grade. Next, to test whether the developed learning model has the potential to improve students' ability to understand the concept of fractions, the N-gain value, which is the difference between the post-test and pre-test scores, is determined. The test results shown in Table 1.6 above show that the N-gain value for the concept repetition aspect is 0.87, including the high category, the mathematical representation aspect is 0.76, including the high category, and the concept application aspect is 0.70, including the medium category. If we look at the average value of the 3 mathematical representation indicators, we get an N-gain value of 0.77, which is in the high category.

Data on students' responses to the learning process using the ethnomathematics-based RME learning model are presented in the following Table 8.

Table 8. Percentage of Student Responses in The RME Learning Model

No.	Aspects addressed	Percentage (%)	
		Interested	Not interested
1.	Student's feelings about participating in learning	95,23	4,76
2.	Student interest in participating in learning	100,00	0,00
3.	Student's feelings about the learning model used	85,71	14,29
4.	Student's feelings about using learning media that connect to local culture	95,23	4,76
5.	Students' opinions on the use of "prol tape" food as a learning medium	100,00	0,00

From the above data, it can be analyzed that students' responses to learning using the ethnomathematics-based RME (Realistic Mathematics Education) learning model show a percentage above 80% in several aspects. Thus, the student's responses to the learning process using these strategies and media are positive. The use of the ethnomathematics-based RME learning model makes the learning atmosphere in the classroom more pleasant. This is the result of the observations made by the researchers. Thus, it can be concluded that the use of the ethnomathematics-based RME learning model is effective and recommended in improving students' conceptual Understanding of the fraction material in the second grade of primary school.

CONCLUSIONS

The implementation of the ethnomathematics-based RME model significantly improved students' understanding of the concept of fractions. Mathematics learning that is associated with culture is easier for students to understand. In addition, this model encourages students to actively participate in learning. This research enriches the RME model with elements of ethnomathematics, offering a new approach that links local culture with mathematics learning. This opens up opportunities for future research on how to incorporate cultural elements into the curriculum, especially in Mathematics lessons. The results of this study can encourage the implementation of policies that are more supportive of the use of contextualized learning approaches, linking to students' daily lives, and making them maintain and love their local culture.

Teachers can apply the ethnomathematics-based RME model in improving the concept of fractions by: explaining to students how the history of making prol tape to introduce the specialty food of Jember city, how to divide prol tape so that a complete understanding of fraction material is obtained. Students can easily understand the basic concept of simple fractions by dividing the prol tape cake into several parts, such as ½, ¼, and so on. However, this study's limitation is that it only develops an RME learning model with one cultural context in the city of Jember, which is limited to using one typical Jember food, prol tape. There are still many typical foods of Jember city that can be explored and relate them to mathematics learning. Future research should explore the implementation of this model with other cultural elements in Jember and other regions.

AUTHOR CONTRIBUTION STATEMENTS

S : Led the research design, developed the RME model, conducted data collection and analysis.

SSD : Contributed to the development of research instruments, performed statistical analysis, and validated the research finding

TSB : Coordinated the fieldwork, facilitated the implementation of the model, and contributed to data collection.

SWI : Reviewed and revised the manuscript to ensure academic quality and alignment with educational theories.

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