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ANALYSIS OF FRACTION CONCEPTS UNDERSTANDING IN THE INDONESIAN REALISTIC MATHEMATICS EDUCATION (PMRI) MODEL : STUDENTS' CURIOSITY PERSPECTIVE

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Abstract

This research was carried out using a mixed-method approach, combining qualitative and quantitative methods. The qualitative method was used to analyze the learning process conducted with the Indonesian realistic mathematics education (PMRI) model. Meanwhile, the quantitative method was used to measure the level of student curiosity and the impact of RME model on curiosity. The effectiveness of RME model was assessed by examining the teaching materials, which had been validated by an expert validator. The results indicated that the teaching materials were valid and suitable for the learning process. To evaluate the level of student curiosity, data collection was performed through questionnaire administration, which revealed that 64% of the students had a high level of curiosity. Furthermore, to determine the extent of PMRI model's impact on curiosity, a quantitative method was used, indicated that 2.5% of the fraction concepts understanding was influenced by student curiosity.

Key words: *Fractions, Curiosity*

INTRODUCTION

Basic Education is one form of educational provision that focuses on laying the foundation for physical and spiritual growth and development (fine and gross motor coordination), intelligence (thinking ability, creativity, emotional intelligence, spiritual intelligence), socio-emotional aspects (attitudes, behavior, and religion), language, and communication. Therefore, the goal of basic education is to enhance personal values and develop life skills. One of the various formal educational institutions that aims to prepare the students for higher education in the Tarub District of Tegal Regency is State Elementary School Kedokansayang 02.

State Elementary School Kedokansayang 02 is located in the Tarub District, Tegal Regency. Administratively, State Elementary School Kedokansayang 02 still faces limitations, the main issue is that the teaching staff generally do not have a strong expertise of their respective fields, resulting in an uneven transfer of knowledge and creativity stimulation. The educators usually act as classroom teachers that responsible for teaching almost all subjects, especially character education.

As stated by (Komara, 2018), good character education should involve not only the aspect of moral understanding (knowing), but also feeling and loving the good (moral feeling) and exhibiting good behavior (moral action). Thus, character education is closely related to habits or continuous practices.

According to (Prastowo, 2019), a thematic learning model is essentially a learning model that utilizes a theme-based approach, emphasizing the active and enjoyable involvement of students. It is not merely aimed at encouraging learners to acquire knowledge (learning to know), but also involves learning to do, learning to be, and learning to live together. Consequently, the learning activities become more relevant to real-life situations and meaningful to students.

Mathematics is generally a subject that is disliked by many students. Based on the perception of parents, they consider mathematics to be a very difficult subject. In fact, they hate the subject. Moreover, some students feel dizzy or get headaches when math class starts. Some students frequently ask for restroom leave permission or simply want to wash their faces. The phenomenon observed is that the existing teaching approach is still conventional, emphasizing only procedures and formula usage. Out of 31 students, only 5 students (16.13%) are able to master the formulas.

Realistic Mathematics is focused at constructing or rediscovering a mathematical concepts through the process of mathematization, which is defined as mathematizing a context and translating it into mathematical concepts. The goal is for students to understand and work within that context using their existing knowledge and experiences (*De Lange, J., 1998)*.

Mathematics is one of the core subjects taught in elementary school. According to the curriculum standards of the National Council of Teachers of Mathematics (NCTM), mathematics has at least four definitions. Mathematics as problem-solving allows students to use problem-solving approaches to understand mathematical content. Some mathematical content is structured in problem-solving situations, requiring problem-solving strategies to comprehend them. Formulating problems from everyday life with mathematical situations is essential in mathematics learning.

The essence of mathematics learning is understanding the concepts. Godino (2015: 2) defined understanding as the mental experience of a subject, where through that experience, the subject can connect one object to another using their senses.

The term "understanding" is also used in the process of student assessment or evaluation. The extent to which students can master a concept is seen from how well their understanding. This is in line with Skemp's opinion (2002: 47) that understanding involves connecting new experiences or ideas with existing schemes. Understanding expands as students adapt to new situations, making it essential for learning mathematics.

The findings of Geller, Son, & Stigler (2017: 122) indicated that students with weaker understanding tend to focus on concrete aspects, while stronger students tend to use concepts to explain their answers. On the other hand, students with higher understanding tend to employ more general concepts. D'Agustin & Smith (1992: 2) suggested that mathematics learning can be enhanced not only through curriculum changes but also through changes in the way mathematics is taught to students.

Novak, D., & Renzo (2013) concluded that fractions are a result of division or representation of parts of a whole number. This reinforces the concept of fractions as a form of division. Musser, G. L., Burger, W. F., & Peterson (2011) stated that fractions can be interpreted in two different ways. First, fractions are used as numbers that represent parts of a whole. Second, fractions are interpreted as ratios or comparisons between two quantities.

Bennet, A. B., Burton, L. J., & Nelson, (2010) illustrated fractions as three concepts: fractions as parts of a whole, fractions as quotients or results of division, and fractions as ratios. According to Marpaung (2001: 3-4), the Indonesian Realistic Mathematics Education (PMRI) approach is based on contextual problems, with active students and teachers acting as facilitators. Students are free to express their ideas, engage in idea-sharing with one another, and the teacher compares the ideas and guides them in making decisions about which ideas are better for them.

Soedjadi (2001: 3) stated that realistic mathematics learning has several characteristics: 1) The use of context. 2) The use of models, bridging by vertical instruments. 3) Students' contribution. 4) Interactivity. 5) Intertwining with other learning topics.

Streefland (in Aris, 2004, p. 148-149) stated that the main principles of realistic teaching and learning are: Constructing and, Levels and models, Reflection and special, Social context and interaction.

Curiosity is believed as a way of directing individuals to acquire extensive information by involving optimal cognitive roles (Ligneul et al., 2018). In line with Daryanto et al. (2013:151), curiosity is an attitude and action that constantly strives to gain deeper and broader knowledge about something learned, seen, and heard.

Mustari (2013) claimed that to develop curiosity in students, they should be given the freedom to explore and satisfy their own curiosity. Students are only provided with ways to search for answers to the questions they have. If the question is about English, the student is given a dictionary, and if the question is about general knowledge, the student is provided with an encyclopedia.

RESEARCH METHOD

This study used a mixed methods approach, which involves combining qualitative and quantitative methods. The mixed methods approach combines the collection of both qualitative and quantitative data, integrates different types of data, utilized diverse research designs, and incorporated philosophical assumptions and theoretical frameworks. (Creswell, 2016).

Quantitative research in this study is used as supporting data to analyze the creative thinking abilities based on students' curiosity. Meanwhile, qualitative research is used to describe the mathematical creative thinking abilities viewed from curiosity in learning process involving the Indonesian Realistic Mathematics Education (PMRI) approach. The study began with the collection and processing of qualitative data, followed by the collection of quantitative data.

This research is about the quality of learning, which consists of:

a. Planning
b. Implementation
c. Assessment with pre-fieldwork and fieldwork stages.

RESULT AND DISCUSSION

A. Result

1. The Effectiveness of the Indonesian Realistic Mathematics Education (PMRI) Model on the Understanding of Fraction Concepts.

The effectiveness of the Indonesian Realistic Mathematics Education (PMRI) model on the understanding of fraction concepts is measured by examining students'

motivation, understanding of learning objectives, engagement in learning, ability to solve problems given by the teacher, and ability to develop or create informal symbolic models for the given problems or issues.

The assessment of the learning quality was conducted through the validation of teaching materials and research instruments. The validation aimed to determine the suitability of the teaching materials and research instruments for the learning process.

The recapitulation of data from the validation of teaching materials can be seen in the following table.

Table 1: Validation Result of Teaching Materials

Teaching Material	Validator Code	Score Mean	Category
Syllabus	V1, V2	59	Very Good
RPP	V1, V2	56	Very Good
LKPD	V1, V2	48	Very Good

Based on Table 1, all the teaching materials used in this study, including the syllabus, lesson plans, and student worksheets, received an excellent rating from the validator. Therefore, it can be concluded that the teaching materials developed are suitable for use in the study.

After the completion of the teaching process, the next step was to assess the learning outcomes.

a) Mean Completion Test

The completion test is used to determine whether the students' understanding of fraction concepts in the experimental class exceeds the BTA.

Table 2: Mean Completion Test Output

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Score	25	71,32	8,533	1,707

Based on the output of the One Sample T-test, the mean value of 71.32 indicated that the average understanding of fraction concepts among students in the class taught using the PMRI model met the BTA.

b) Mean Comparison Test

This test is used to determine the difference in the average understanding of fraction concepts between the experimental group and the control group. For this test, a one-tailed t-test is used.

Tabel 3: Mean Comparison Test Output

	Class	N	Mean
Score	Experimental Class	25	71,32
	Control Class	30	62,50

Based on Table 3, the average scores between the experimental group

and the control group are different. In the experimental group, the average score is 71.32, while in the control group, it is 62.50. Therefore, it can be stated that the average score in the experimental group is higher than the control group.

2. The Understanding Capability of Fraction Concepts in the Indonesian Realistic Mathematics Education Model from the Perspective of Curiosity

After undergoing the learning process with the Indonesian Realistic Mathematics Education (PMRI) model, students were given a curiosity questionnaire to measure their final level of curiosity after receiving the treatment.

Tabel 4: Students' Level of *Curiosity*

Category	Frequency	Precentage
High	16	64%
Moderate	9	36%
Low	0	0%

Based on the final level of curiosity presented in Table 4, it is known that out of 25 students, there were 16 students who have a high level of curiosity, accounting for 64% of the total students. Meanwhile, there were nine students who have a moderate level of curiosity, which is approximately 36% of the total students, and there were no students with a low level of curiosity.

3. The influence of Curiosity on the Understanding of Fraction Concepts

After determining the level of students' curiosity, the next step was to examine the influence of curiosity on the understanding of fraction concepts using linear regression analysis.

Tabel 5: The Magnitude of Influence of Curiosity on The Understanding of Fraction Concepts

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.158[a]	.025	-.018	8.607

a. Predictors: (Constant), Students' Curiosity

Based on Table 5, the R square value was 0.025 or 2.5%. This value indicated that curiosity influenced the understanding of fraction concepts by 2.5%, while 97.5% of the understanding of fraction concepts is influenced by other factors. However, it can be said that curiosity has an effect on the understanding of fraction concepts.

B. Discussion

1. The Effectiveness of the Indonesian Realistic Mathematics Education (PMRI) Model on the Understanding of Fraction Concepts

The construction of teaching materials was aligned with the curriculum in Grade VI of elementary

school, consisting of syllabus, lesson plans (RPP), teaching aids, comprehension tests for fraction concepts, curiosity questionnaires, test blueprints with answer keys and scoring rubrics, interview guidelines, lesson observation sheets, and student response questionnaires. The quality of this teaching materials is measured through the validation of teaching materials and research instruments.

Based on the assessment by expert validators, the average scores for all teaching materials were in the "very good" category, indicating that the developed teaching materials were suitable for use in the research. Furthermore, the assessment by expert validators for the research instruments also generated average scores in the "very good" category, indicating that the developed instruments are suitable for use in the research.

The expert validation results indicated that the planning, in the form of teaching materials to be used in the research, was categorized as good quality. Therefore, it can be said that the teaching planning is of high quality.

Considering the assessment results, it was found that 77% of students who underwent the PMRI learning process achieved proficiency or exceeded the Minimum Mastery Criteria (BTA). In addition, the average score obtained by the students was 71.32, which indicated that the average score of students taught using PMRI exceeded the BTA with a score of 70. Based on these two aspects, it was concluded that the class teached with the PMRI model achieved proficiency. This is consistent with the research findings by M Rusli (2020) which showed that the realistic mathematics learning approach can improve students' understanding of fraction concepts.

Apart from achieving proportionate and average proficiency, the results also showed that the proportion of students achieving proficiency in the class that received teaching using PMRI was higher than the students in the control class. Furthermore, the impact of students' curiosity on their understanding of fraction concepts in mathematics learning was examined. Based on the assessment results, the level of students' curiosity contributed to a 2.5% influence. The remaining 97.5% was influenced by other factors not discussed in this research. This is consistent with a study conducted by Jeheman et al. (2019) that the use of PMRI in mathematics learning, specifically on the topic of systems of linear equations with two variables, has a positive effect on students' understanding of mathematical concepts.

2. The Understanding Capability of Fraction Concepts in the Indonesian Realistic Mathematics Education Model from the Perspective of Curiosity

In the assessment phase of this research, students were given a curiosity questionnaire to measure their level of curiosity after being exposed to the implementation of

mathematics learning with the PMRI approach. The results obtained from the questionnaire indicated that students' curiosity levels increased compared to before the implementation PMRI approach.

Prior to the implementation of the PMRI approach in mathematics learning, out of 25 students, 19 students had a moderate level of curiosity and 6 students had a low level of curiosity. Thus, there were no students with a high level of curiosity. However, after the implementation of mathematics learning with the PMRI approach, there was a change in students' curiosity levels. After students underwent learning with the PMRI approach, there were 16 students with a high level of curiosity and 9 students with a moderate level of curiosity, with no students having a low level of curiosity. This indicated that the PMRI approach can enhance students' curiosity.

3. The influence of Curiosity on the Understanding of Fraction Concepts

The final analysis of this research was to measure the influence of curiosity on the understanding of fraction concepts. It was found that curiosity has a linear relationship with the understanding of fraction concepts. This is consistent with Samani et al. (2012: 119), who stated that curiosity is the desire to investigate and seek understanding of the mysteries of nature or current social events. Therefore, with curiosity in students, their thirst for knowledge will increase, and they will dive deeper into what is being learned.

In this study, it was also found that students' curiosity influenced the understanding of fraction concepts by 2.5%. Meanwhile, 97.5% was influenced by other factors not discussed in this research. This is consistent with a study conducted by Jeheman et al. (2019) which stated that the use of the PMRI approach in mathematics learning, specifically on the topic linear equations system with two variables, has a positive effect on students' understanding of mathematical concepts.

The results indicated that the influence of curiosity on the understanding of fraction concepts may not be significant, accounting for only 2.5%. However, no matter how small the impact, curiosity still plays a role in students' understanding of fraction concepts. Therefore, by enhancing students' curiosity, it will have an impact on improving their ability to understand fraction concepts.

CONCLUSION

Referring to the research results and discussions that have been previously explained, the conclusions of this study are as follows:

1) Learning with the Indonesian Realistic Mathematics Education (PMRI) Model on the Understanding of Fraction Concepts can be considered effective at SDN Kedokansayang 02. This can be seen based on the average mastery level of students.
2) The PMRI learning model can enhance students' curiosity at SDN Kedokansayang 02.

3) Curiosity has a positive influence on the understanding of fraction concepts in mathematics learning at SDN Kedokansayang 02.

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