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Ethnomathematics in Fraction Numeracy Ability of Fifth-Grade Students in The Merdeka Curriculum

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Abstract

Efforts to improve educational services in the 5.0 era have been developed by implementing a Merdeka curriculum. In its implementation, learning is expected to be student-centred with the hope that each student will achieve minimum competencies, including numeracy and literacy competencies, without losing national identity. Low student learning outcomes in problem-solving abilities on fractions result in an incomplete understanding of the concept, so students are not trained to critical thinking. This research aims to describe ethnomathematics in students' fraction numeration abilities in the Merdeka curriculum using qualitative methods with a hermeneutic phenomology type involving 5 people out of 26 fifth-grade students and mathematics teachers. Data was collected using written tests and interviews with participants and processed using Moustaka's analysis stages and Paul Ricoeur's interpretation theory. The results of research through test and interviews show that 3 out of 5 students already understand the prerequisite fraction material and can solve fraction simple problems based on ethnomathematics. However, these 5 students had obstacles in solving fraction calculation operation problems. Apart from that, the results of teacher interviews show that learning focuses on cultivating concepts without contextually involving culture. Research can be concluded as a constructive reference for improving fraction numeration skills through ethnomathematics in the Merdeka curriculum.

Keywords : Ethnomathematics, Fraction, Numeracy Ability, Merdeka Curriculum..

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INTRODUCTION

Education is currently faced with various severe challenges in creating superior students and the expected learning outcomes as preparation for competing in the era of the Industrial Revolution 5.0. This is in line with the government's ongoing efforts to perfect the education curriculum in Indonesia to improve the quality of education according to the times. Implementing the Merdeka curriculum based on KEPMENDIKBUDRISTEK No. 56 of 2022 is a clear example of the government's attention to recovering learning lags that occur by adjusting the conditions of educational units, regional potential, and students. The Merdeka curriculum has learning objectives to implement Ki Hajar Dewantara's philosophy, which is student-centered, where each student can achieve the expected learning goals and strengthen students' numeracy competencies. This can be seen from the PISA results in 2018 in the field of mathematics, which obtained an average score of 379, and according to the OECD (Organization for Economic Co-operation and Development), around 71% of students did not reach the minimum competency level in problem-solving abilities (Puspendik, 2019). These findings are the basis for assessing 21st-century skills that must be improved and perfected in education, especially in numeracy skills.

Ideally, this mathematical ability needs to be improved through learning mathematics, especially in elementary school, to provide appropriate mathematical concepts early on. There is a uniqueness in mathematics learning in elementary school due to differences between the characteristics of mathematics and the nature of children (Karso, 2014). Priatna & Yuliardi (2019) revealed that the nature of elementary school children have stages of thinking that are real and can be seen based on what is happening in their environment, which is not by the characteristics of mathematics, which are still abstract. In addition, (Janah, 2019) explained that mathematics learning in the 21st century emphasizes critical thinking skills and mastering science and technology, which will be realized if students have good numeracy skills. Therefore, preparing students' readiness to receive material with their thinking abilities is necessary. This needs to be adapted to developments in science in the 5.0 era, one of which is learning mathematics in the Merdeka curriculum to provide 21st-century skills integrated with mathematical concepts in students' numeracy abilities.

Facts on the ground show that mathematics learning in Indonesia still needs to entirely focus on students' diverse mathematical abilities with various learning methods that are increasingly being developed and researched (Balkist et al., 2022). This results in students experiencing obstacles in understanding mathematical concepts because they often think mathematics is scary and challenging to learn (Yeni, 2015) according to the findings of (A Rosid,

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2021), this impacts learning because students have didactic learning obstacles in fraction material. The learning process needs to be fully conveyed, and student learning outcomes must be higher in working on contextual fraction material questions. In connection with improving learning outcomes, students need teachers as facilitators to bridge students' thinking processes in solving problems using numeracy skills (Suwangsih & Tiurlina, 2006). Apart from that, there are references to process standards regarding mathematics learning that are integrated with students' cultural backgrounds (Permendikbud No. 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar Dan Menengah., 2016). This can increase students' numeracy skills without diminishing national identity by introducing culture in mathematics learning in the 5.0 era. However, all these processes must be adapted to the current curriculum, namely the Merdeka curriculum, which aligns with student-centered learning expectations. Integrating mathematics learning with culture is something that can be said to be new in the world of education. Where this learning is often known as ethnomathematics. Ethnomathematics was first introduced by D' Ambrosio, namely a way or method to overcome environmental problems with culture (Turmudi, 2018). In line with this opinion, Kurumeh (2004) said that ethnomathematics-based mathematics learning is an approach that can explain the relationship between the cultural environment and mathematics. Ethnomathematics could be an alternative to improve students' numeracy skills.

Numeracy ability is a skill in mathematics to solve mathematical problems in everyday life (Pangesti, 2018). Numeracy can be found in mathematics, such as fractions. Without realizing it, fraction material is often implemented in everyday life; it is just that students need to understand the concept of fractions (Baharuddin et al., 2021). This numeracy ability is so important in mathematics today that the Ministry of Education and Culture replaced the national exam with the Merdeka curriculum's Minimum Competency Assessment (AKM). The Merdeka curriculum is a curriculum that is planned to make efforts to restore learning with more optimal content and sufficient time to explore concepts. It is hoped that teachers will be free to prepare lessons tailored to students' needs and interests.

The need to improve educational services in the Merdeka curriculum, especially mathematics learning, requires good numeracy skills to equip students with critical thinking skills in the 21st century to face various global challenges in the future without losing national identity. Learning mathematics through multiple methods may be familiar; various ethnomathematics studies have also been widely researched, but ethnomathematics in fraction numeration skills in the Merdeka curriculum are exciting to study. So, through a hermeneutic phenomenology approach, we can describe ethnomathematics in the Merdeka curriculum's fraction numeration

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abilities of elementary school students.

METHODS

The method used by researchers to describe ethnomathematics on elementary school students' fraction numeration abilities in the Merdeka curriculum is a qualitative method with a hermeneutic phenomenological approach. Hermeneutic phenomenology is designed to reveal experiences and the meaning associated with these experiences (Lindseth & Norberg, 2004) This research was conducted in one of the state elementary schools in Bandung City on grade 5 students who had studied fractions. Participants in this study involved 26 students who were taken using a non-probability sampling technique using purposive sampling by taking five samples, which were reviewed based on the results of the respondent's ability test.

The research procedures were carried out based on three stages: 1) In the Planning stage, the researcher will determine the research focus topic, conduct literature studies, and formulate the problem. 2) In the preparation stage, the researcher determined the participants and prepared written test instruments and interviews regarding ethnomathematics in fraction numeration abilities. 3) In the implementation stage, researchers tested written test instruments and then summarized the results to validate them by interviewing students and mathematics teachers. The results of the interviews were summarized in transcript form. 4) In the analysis and interpretation stage, researchers will analyze all participant data, identify interview results, and conclude.

The main instrument of this research is the researcher himself. However, the supporting instrument during the research was an ethnomathematics-based written test containing five questions containing prerequisite material and contextual fraction material for students. In addition, an interview guide with open questions was developed based on participant responses. With the data obtained, it was analyzed based on Moustakas' phenomenological analysis stages and Paul Ricouer's theory of interpretation (Lindseth & Norberg, 2004) with steps 1) Preparing data for analysis; 2) Explanation; 3) Naïve understanding; 4) In-depth Understanding; and 5) Appropriation.

RESULTS AND DISCUSSION

Results of Written Tests and Interviews on Students' Meaning of Fraction Concepts In this section, the researcher will describe the findings and discussion regarding ethnomathematics in the fraction numeration abilities of fifth-grade students in the Merdeka curriculum. The

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researchers obtained these findings through written tests and interviews with participants. The written test contains five ethnomathematics-based description questions containing prerequisite material and material on fraction calculation operations contextual to culture. This question was given to 26 students directly with a working duration of 30 minutes. After carrying out the test, purposive sampling was carried out on students by selecting five students based on the lowest and highest results to explore in depth through interviews to reveal the meaning of students' mathematical concepts in the fraction questions given and explore the learning experiences students had in studying fraction material. In-depth interviews were conducted with mathematics teachers to find the meaning of ethnomathematics in students' fraction numeration abilities and learning experiences. Below, the researcher describes the results of written tests and in-depth interviews regarding the content of each student in this research.

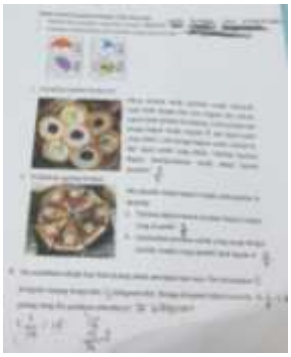


Figure 1. Student Written Test Results 1

Based on Figure 1, it can be seen that 1) the first indicator question is that students can interpret the prerequisite material by describing the concept of fraction material. However, after exploring it through interviews, students needed to fully understand the concept of fractions because students answered the questions by remembering what had been said and explained during the lesson rather than interpreting it as a whole. 2) The second question was answered correctly by the students when traced. The students could explain how the answer was obtained, as did 2/4 of the students who answered that they got this result because two parts were shaded out of 4. 3) In the third question, students mistakenly filled in the answer. Students could solve and analyze parts of the original and chocolate durable, but when asked to convert them into fractions, they answered 3/4. Through interview research, it turned out that student 1 had problems interpreting the results of trial solving in determining the fraction of original surabi and brown surabi. 4) in the fourth question, students can answer the indicators for part a and explain how to determine the value of the fraction in the wingko presented in the picture. However, in

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part b, students needed help simplifying the fractions in part A into equivalent fractions. After exploring it through interviews, it turned out that students did not understand how to change fractions into equivalent fractions. 5) Based on the results of the final question, students could not change mixed fractions into improper fractions, so they produced whole numbers. This impacted student 1's calculation process, so students answered the question incorrectly. Through in-depth interview research, student 1 needed help remembering how to change mixed fractions to improper fractions. However, in-depth, it turned out that he needed help understanding how to add fractions with different denominators.

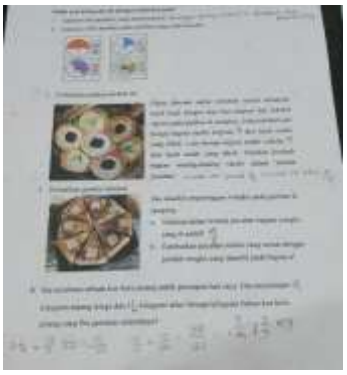


Figure 2.Student Written Test Results 2

In Figure 2, Student 2's written test results can be described as follows: 1) Student 2 answered the first question and explained what he wrote and how the student got this meaning. 2) On the second question, student two could complete four parts of the question and answer correctly. After exploring it through interviews, student two could explain the results obtained based on the shaded part of the whole part. 3) Student 2 on the third question answered correctly and provided clear information when interpreting the brown and original surabi on fractions. Through interviews, student 2 strengthened his answer with appropriate arguments. 4) In the fourth question, student two could answer parts a and b correctly, while student three also answered using pictures, and the resulting fraction was 2/4. After searching, look for simpler equivalent fractions. 5) Student 2 on the fifth question, even though the processing procedure needed to be organized, student 2's answer needed to be corrected when calculating fractions with different denominators, with the result that the final denominators were not equalized first but added directly. Through interviews, student 2 explained that he made mistakes and needed to be more careful when doing his work, but when allowed to rework, he could do it correctly.

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Figure 3. Student Written Test Results 3

Based on Figure 3, the results of student 3's answers can be described as follows: 1) Student 3, in the first question, knows the concept of fractions. However, when exploring through interviews, student three needed help understanding what fractions meant and answered the origin of the number one based on what came to mind. 2) It was proven that in question number 2, student three could not interpret the fractions in the parts of the circle presented. Student 3 interprets each part of the circle with different concepts. After tracing it, it turned out that student 3 was wrong in determining the fraction number corresponding to the picture for the three parts. Student 3 had the same concept: calculating the shaded part as the numerator and the shady part as the denominator. However, for the last circle part, student 3 answered that the three shaded ones were in the numerator, but the 13 unshaded parts counted as 12 in the denominator. Student 3 made a mistake in calculating the part that needed to be shaded. 3) Student 3 in question number 4 was able to study the brown and original surabi parts but interpreted each part of the surabi as 3/4. After tracing it through interviews with student 3, it turned out that the results were ¾ of the original Surabi 3 as the numerator and the chocolate Surabi 4 as the denominator. 4) In question number four, student three did not fill in because he could not interpret question four well based on the interview results. 5) In question number five, student 3 tries to change mixed fractions to whole numbers and does not add up the results. Based on student 3's interview results, it turns out that getting 15 was from adding mixed fractions, namely 1 x 14 + 1 = 15, as well as the egg's weight. So, student three immediately got 30 without proper processing procedures.

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Figure 4. Student Written Test Results 4

The following is a presentation of the results of student 4's answer based on picture 4. 1) Student 4 answered the question correctly regarding the concept of fractions that he had after exploring it further through interviews. Student 4 explained that he remembered that fractions consist of a numerator and a denominator, based on student 4's learning experience. Knowing that the quantifier he refers to is the shaded part of the whole. 2) On the second question, student 4 answered correctly according to his understanding of fractions in number one. 3) Student 4 in question number 3 answered correctly and explained the parts of each Surabi using fractional numbers. 4) In question number four, student 4 had the same answer as student 2. 5) In the last question, student 4 tried to change mixed fractions without writing down the procedure, so in the procedure, student four immediately added the results of changing ordinary fractions to mixed fractions by incorrectly determining the denominator. After investigating, student four needed to be more careful in equalizing the denominators of the fractions before adding the fractions because he made a mistake. After all, the numerators were the same, and there was no need to change the denominator first.

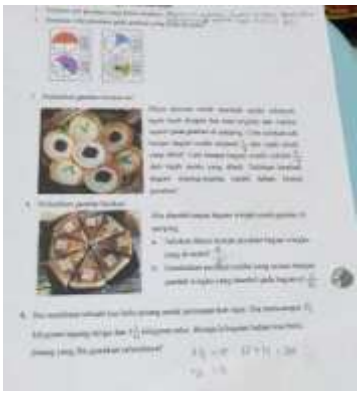


Figure 5. Student Written Test Results 5

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Based on Figure 5, the following explains Student 5's results in answering the question above: 1) Student 5 in the first question means that a fraction is a number found in squares and triangles. This was an interesting question for the researcher; based on the interview results, student 5 got this answer based on his thinking that he had experienced learning that a divided box or triangle would have the intended fraction. 2) In the second question, student 5 gives the correct answer and gets the answer based on what is shaded as the numerator of the whole part of the circle. 3) Student 5 answered question number three by writing the fraction form directly in the question section, calculating only the parts in the original surabi 3/7, which should be three parts of 7. After tracing this, it was found that the student understood the question directly but needed to be more careful with the instructions. It is intended so that the processing procedure directly interprets it into fractions. 4) Student 5 answered question 4 correctly, but in part B, student 5 gave a fraction equivalent to a more significant number. Based on the interview results, student 5 answered this because he only remembered to find the equivalent fraction directly multiplied by the two parts of the numerator and denominator. Meanwhile, on the last question, student 5 had almost the same answer as the other four students. It does not change mixed fractions to improper fractions but to whole numbers. In the procedure, student five immediately added up the results of changing the fractions to get a result of 30. This was obtained because student 5 was wrong in determining the correct fraction from the mixed fraction.

Student Learning Experience Interview Results

The results of interviews with five students from the seven open questions can be classified as follows: it turns out that 3 out of 5 students need clarification about enjoying mathematics lessons. All students answered that they only got learning resources at school, but 3 out of 5 students answered that they had other learning resources from tutoring places. Apart from that, open question number three has been explained in the previous section. In this question, students are asked to answer the procedure for working on each question presented and the reasons to explore the factors that occur in solving the question. All students need help with questions on average because they need to get used to the contextual form. Apart from that, 1 in 5 students need help understanding the concept of fractions and interpreting parts of a circle into fraction form. 2 out of 5 students had difficulty determining the proper fraction part in ethnomathematics question number 3 and determining equivalent fractions. Almost all of the five students experienced difficulty in working on question number 5, which did not have pictures but was based on contextual ethnomathematics. In question number 5 regarding "How does the teacher

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teach fraction material," almost all students experience the same learning experience, but it is related to the media used. Based on question number 6, on average, students interpret the concept of fractions using just paper as the media for students to try to solve the idea of a fraction as a part of a whole. Regarding question number 7, 4 out of 5 students answered that the teacher never gave questions about fractions related to culture. However, several times in tests, the teacher has given story problems in mathematics learning according to the content.

Mathematics Teacher Interview Results

Based on the results of interviews with teachers, the researcher obtained the following information: the curriculum used by the school for this year is a Merdeka curriculum with the implementation of a changed Merdeka pathway, which is only applied in grades 1, 2, 4, and 5. In mathematics learning for fraction material, this is a supporting package book. Only those given by the school are used. During learning fraction material, students are given simple props that each student has. However, unfortunately, during the learning of fractions, teachers have never used an ethnomathematics approach because the teacher only focuses on understanding the meaning of fractions without involving cultural elements. Apart from that, teachers must still familiarize themselves with ethnomathematics. To measure students' achievement in this material, the teacher gives multiple-choice questions; some are developed using story questions to measure students' numeracy skills in the fraction material. The difficulties experienced are that it is easier for teachers to instill the concept of fractions with concrete objects. Apart from that, many factors become obstacles for teachers because students' prerequisite knowledge of fraction material still needs to be fully intact. After all, the primary fraction material that should have been taught in previous courses needs to be improved because of the COVID-19 emergency in Indonesia's education system. So, the average student test score reaches less than 60 out of 100.

DISCUSSION

Based on the findings of student responses to written test questions and interviews, researchers observed that all students experienced difficulty in working on the ethnomathematics-based questions presented. There needs to be more consistency between the results of student work and concept definition, which students reveal through interviews.

Starting from questions 1 and 2, some students still need help understanding the concept of fractions. This could be due to the findings of Herman (2010) that students at elementary school age understand concrete objects to understand reality. Furthermore, questions 3 and 4 indicated

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that Shiva was not careful in determining the fractions in the wingko in the picture. Juliyanti (2016) found that 33 students experienced errors in solving questions because they forgot and were not careful. They were supported by the findings of (Fatahillah et al., 2017), who found that 69.24% of students had errors in understanding questions due to their lack of mathematical understanding. (Abdurrahman, 2003). In detail, students experienced errors in determining the numerator and denominator, who found that 3 out of 12 students experienced errors in their fraction operation skills. This aligns with (Suryadi, 2019) that cognitive conflicts in a person's concept definition will result in inconsistency or flexibility when faced with specific situations. Therefore, students' use of the concept of addition and subtraction of fractions still needs to be completed, causing a suboptimal understanding of the subsequent material.

Based on the results of interviews, it was identified that students experienced learning obstacles while learning ontogenically, epistemologically, and didactically. As many as 80% of students have misconceptions about mastering the prerequisite fraction material, according to the findings of (Malikha & Amir, 2018). Apart from that, the main focus of most of the research findings is that students have urgency where students are not aware of the use of the concept of fractions in everyday life. This shows that in its implementation, students' fraction numeration abilities still need to improve, as research results show that students experience many obstacles and limitations in solving problems through an ethnomathematics approach. In line with the opinion of (Turmudi, 2009). Moreover, with the implementation of the new curriculum, it is a challenge for educators and students to achieve learning goals with fun and meaningful learning. Creating fun, meaningful, and cultural education can be done by constructing students' knowledge through ethnomathematics to facilitate students' numeracy skills in fraction material.

CONCLUSIONS

Based on the results of the presentation of findings and discussion, it can be concluded that in the implementation of learning fraction material in class V in the Merdeka curriculum in one of the state elementary schools in the city of Bandung, it was found that there were problems with numeracy skills, both from the students themselves and the learning process. In general, 3 out of 5 students were able to solve simple fraction problems. Meanwhile, in completing ethnomathematics-based fraction calculation operations, the five students experienced obstacles. This, as an illustration of the learning implementation process, does not identify the use of the ethnomathematics approach as an alternative to improving students' fraction numeration abilities in the Merdeka curriculum to equip students to face the challenges of the 21st century

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with all the competencies that 21st-century students must have.

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AUTHOR CONTRIBUTIONS STATEMENT

Author AA in this research is the sole researcher who has observed problems that occur in the field, analyzed and raised research problems. Then design the research and prepare all the forms needed when collecting data in the field and making reports.

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