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Implementation of Ethnomathematics Approach to Improve Mathematical Understanding of Grade V Students of Cipinang Elementary School 03

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Abstract

This classroom action research was carried out with the aim of improving the mathematical understanding of class V students at elementary school Cipinang 03. The subjects in this research were 31 class V students. The classroom action research model used is the Kemmis and MC Taggart model, which consists of two cycles with stages, namely planning, action and observation, reflection. Research data consists of process data and student learning outcomes data. The data process was obtained through observing teacher and student activities, as well as mathematical understanding data obtained through tests. The conclusion of this study is that there is an increase in mathematical understanding in each cycle to be able to show that the application of the ethnographic method has been successful in improving students' mathematical understanding. The ethnographic approach has been shown to provide an important cultural context for students, so that the original abstract mathematical concepts become more specific and suitable for everyday life. Thanks to the integration of local cultural elements in mathematics, students can develop a stronger relationship between formal and informal mathematical knowledge, ultimately deepening their understanding of their concepts. In addition, this method also succeeded in increasing participation and motivation for students, this is reflected in their active participation and positive attitudes towards learning mathematics.

Keyword: Ethnomathematics Approach, Mathematical Understanding, elementary school students

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INTRODUCTION

Education is a strategic step to improve the quality of the next generation with the aim of developing the abilities and character of students into individuals who are faithful, devout, have noble characters, are healthy, knowledgeable, creative and independent. Education is considered successful if it can achieve these goals, which ultimately

influences students' thinking patterns and behavior. At elementary school level, the development of this mindset can be realized through learning mathematics. Mathematics is a science that studies abstract things, calculations and symbols, and requires the ability to think logically and have understanding so it needs to be studied from an early age (Ritonga et al. 2023). The implementation of mathematics learning in the 2013 curriculum tends to focus more on being student centered to develop abilities in the cognitive, affective and psychomotor domains through contextual-based learning. In contrast to the 2013 curriculum, the Merdeka curriculum, which currently almost all schools use, implements mathematics learning into three phases. Phase A is in classes I and II, Phase B is in classes III and IV, and Phase C is in classes V and VI. Apart from that, the aim of the mathematics subject stated in the Decree of the Head of the Educational Standards, Curriculum and Assessment Agency regarding Learning Achievements in Early Childhood Education, Primary Education and Secondary Education Levels in the Independent Curriculum is to equip students with mathematical understanding and procedural skills, the ability to use mathematical reasoning and proof, solve problems, communicate and represent mathematical concepts, link mathematics learning with other fields of science in everyday life, and have an attitude of appreciating the importance of mathematics in life (mathematical disposition) (Kemendikbud, 2022). In line with this explanation, mathematical understanding is one of the abilities that elementary school level students must have.

As is the learning principle recommended by the National Council of Teachers of Mathematics, "students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge" (NCTM, 2000). This means that students must learn mathematics through understanding, actively building new knowledge from experience and previous knowledge. Mathematical understanding is one of the abilities that must be possessed and emphasized by students. Mathematical understanding does not only involve mastering formulas or procedures, but also a deep understanding of the meaning behind the concept. Mathematical understanding can enable students to know why a mathematical procedure is carried out, not just how to do it. Students certainly have different mathematical understandings but developing them cannot be separated from themselves. This statement essentially shows that all students can understand mathematics.

Findings from observations, interviews with class teachers, and data analysis of student learning outcomes in previous lessons in class V-B at elementary school Cipinang 03, found that students' mathematical understanding needs to be paid attention to. This statement is shown by students who feel that mathematics is a difficult subject, because there are only numbers and formulas in the learning process. Students are less able to understand the material in depth, so students experience obstacles and difficulties when using mathematics procedurally in solving problems and understanding questions

presented in story form. During the mathematics learning process, most of them cannot differentiate between one mathematical concept and another mathematical concept. When learning mathematics, it is also seen that students cannot answer when the teacher asks them to give examples of the mathematical concepts they have learned, students are unable to solve problems that are different from the examples given by the teacher. Students tend to be passive and not actively involved during the learning process, because so far, they only depend on the teacher's explanation of the concept of the material and do not try to find an understanding of the material being studied. Based on data obtained from pre-research in class V-B at elementary school Cipinang 03 regarding mathematical understanding tests in mathematics subjects, it shows that there were 25 students (81%) who scored less than the passing criteria and only 6 students (19%) who reached the completion criteria.

Based on these problems, it is necessary to have an approach that can be used to improve students' mathematical understanding and make mathematics subjects easier to understand and considered enjoyable by students. Currently, there are many learning approaches that teachers can apply when teaching, especially in mathematics subjects which are often said to be difficult. Piaget stated in the theory of cognitive development that elementary school students can think logically through concrete objects or situations that can be observed directly (Juwantara, 2019). In line with this statement, in this study the researcher chose an approach that was able to increase student motivation, namely through ethnomathematics.

Ethnomathematics is considered capable of developing students' mathematical understanding abilities through culture-based learning. Through an ethnomathematics approach, students can understand, manage and apply cultural concepts in solving mathematical problems and practicing them in their environment (Sulaiman, 2020). Apart from that, the ethnomathematics approach also presents mathematics learning contextually, so that it can stimulate students to participate actively in learning activities and be able to understand mathematical concepts well and make learning more meaningful (Hartanti, 2021). Ethnomathematics in the mathematics learning process can be seen as an approach that can motivate students to study mathematics through the connection between the material and real examples, daily life, existing local culture or the habits of the surrounding community. Therefore, ethnomathematics not only helps improve mathematical understanding, but also enriches students' learning experiences.

The differences between this study and the previous ones can be seen from several things, namely: This study has integrated elements of Betawi culture (considering the position of Cipinang 03 in Jakarta) in mathematics. For example, the use of Betawi decoration samples to explain geometry concepts or using traditional Betawi games to understand the concepts of probability and statistics.

Development of Ethnomathematics-Based Learning Modules Creating mathematics learning modules that integrate local cultural elements with the fifth-grade mathematics curriculum. Project-Based Collaborative Learning Approach Developing a mathematics learning approach through collaborative projects that require students to explore mathematics in their culture. Students can use digital devices to record, analyze, and present mathematical findings in local culture. Development of Ethnomathematics-Based Assessment Instruments Designing assessment instruments that not only measure understanding of mathematical concepts, but also students' ability to apply these concepts in the context of local culture. Interdisciplinary Approach Integrating mathematics learning with other subjects such as arts and culture, social studies, and Indonesian through an ethnomathematics approach, thus creating a holistic and meaningful learning experience. Folklore-Based Pedagogical Approach Using local folklore as a context to introduce and explain mathematical concepts, so that learning becomes more interesting and relevant to students.

This is reinforced by previous research discussing efforts to increase mathematical understanding abilities through an ethnomathematics approach. Previous research has proven that the application of an ethnomathematics approach is considered capable of improving students' mathematical understanding (Mulyasari, 2021; Fajriah, 2023; Winahyu, 2020). Research conducted by researchers has differences in aspects of learning steps and research subjects. Apart from that, there is a novelty in the approach of ethnomathematics, namely in the variety of media or teaching aid used in the form of the local culture of the people of Jakarta. Based on the description above, the researcher is interested in conducting classroom action research with the title "Implementation of an Ethnomathematics Approach to Improve Mathematical Understanding of Class V Students at SDN Cipinang 03".

METHODS

This research method uses classroom action research. The research subjects were class V students at Cipinang State Elementary School 03 located on Jalan Cipinang Timur III, Cipinang Village, Pulogadung District, East Jakarta. There are 27 students in class V, namely 13 men and 14 women. The research was carried out in the second semester of the 2023/2024 academic year, with three cycles using the Kemmis & Taggart model consisting of planning, action and observation, reflection. The classroom action research model is presented in Figure 1.

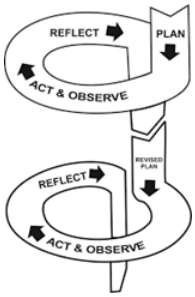

Figure 1. Kemmis & Taggart PTK Cycle

The data collection techniques used are as follows:

a. Written test
   The test is used because of actions to determine the development of students' mathematical understanding abilities after using an ethnomathematics approach
b. Observation sheet
   Monitoring data on teacher and student activities during mathematics learning using an ethnomathematics approach filled in by observers
c. Documentation
   Recordings that can be used as tools to analyze the learning process are in the form of photos or videos.

Research Data Validation Techniques

Data validation techniques that can be used in research on the application of ethnomathematics approaches to improve mathematical understanding of fifth grade students at SDN Cipinang 03:

1. Data Triangulation
   a. Source Triangulation: Comparing data from various sources such as teacher, student, and parent interviews.
   b. Method Triangulation: Using several data collection methods such as observation, interviews, and documentation to check the consistency of findings.
   c. Time Triangulation: Collecting data at different times to ensure consistency of results.

2. Member Checking
   Involving research participants (teachers and students) to check the accuracy of data and interpretation, ensuring that the researcher's understanding of the application of ethnomathematics is in accordance with the reality in the field.
3. Peer Debriefing
   Discussing the research process and findings with colleagues who were not involved in the research to gain new perspectives and identify potential biases.
4. Audit Trail
   Documenting in detail all research procedures, methodological decisions, and data analysis processes, so that the research can be verified and replicated.
5. Instrument Validity
   a. Content Validity: Ensuring that the research instrument covers all aspects of ethnomathematics that are relevant to local culture and fifth grade mathematics material.
   b. Construct Validity: Ensuring that the instrument measures mathematical understanding in accordance with the theoretical framework used.
   c. Reliability Test: Measuring the consistency of the research instrument.
6. Negative Case Analysis
   Identifying and analyzing cases that do not fit the general pattern to strengthen the research conclusions.
7. Prolonged Engagement
   Conducting research over a long period of time to build trust with participants and understand the cultural context in more depth.
8. Thick Description
   Presenting an in-depth description of the context, participants, and process of implementing ethnomathematics at SDN Cipinang 03, so that readers can assess the transferability of the research results.

RESULTS & DISCUSSION

Result

Cycle 1

The plans prepared by the researcher include: (1) prepare a research schedule, namely the implementation of cycle I is carried out for 3 days starting from 9, 10, 13 January 2025, every 07. The teacher asks the students according to the schedule to lead a prayer together in front of the class followed by other friends.

Figure 2. Prayer Activities

This activity begins with the teacher carrying out the stages of an ethnomathematics approach. The first stage is exploration, the teacher provides stimulus through interesting questions about traditional games that are around or have been played by students, have you ever played traditional games? ‘‘ever ‘‘, what is the name of a traditional game that you have ever played? ‘‘Students actively respond to questions given by the teacher. The teacher also provides an overview of the traditional games that will be used, namely the use of congklak on multiples, common multiples, and KPK numbers to explore students` mathematical ideas based on their respective knowledge.

At this stage, students will guess traditional games through picture guessing games presented by the teacher.

Figure 3. The teacher provides stimulus and illustrations through Cultural Exploration

The second stage is mapping, the teacher presents a concrete form of the congklak game and asks the students a question, did you know that we can use the congklak game to study multiples, common multiples and the KP of numbers. Students are given the opportunity to try out the congklak game with example problems given by the teacher relating to multiples, common multiples, and the KPK of numbers. Students are still confused about understanding the meaning of the questions given and how to use the congklak game to find multiples, common multiples and the KPK of numbers.

Figure 4. Students Try Out the Congklak Game

The third stage is explanation, students join the groups that have been distributed. The teacher divides the students into 4 groups consisting of 7-8 people in each group. This group is determined based on where the students sit.

Then the teacher distributes LKPD and asks students to communicate interactively in working on it. Students are given the opportunity to solve problems contained in the LKPD in accordance with the work instructions. Each group has received congklak props that will help them in the work process. Each group plays congklak as appropriate to predict the possible outcomes of the problem and find a deeper understanding of number multiples.

Figure 5. Students Play Congklak

During the work on LKPD and group work, many students experienced difficulties and tended to ask the teacher more questions, because when the teacher gave work instructions, many students did not pay attention. This results in ongoing group discussion activities tending to be passive and monotonous. The teacher also found that there were 2 students who were unable to join their group of friends to discuss together.

After completing the LKPD, each group was asked to present the results of their work. This group presentation was carried out based on the results of the spin that the teacher carried out with the students. Based on the results of group 4`s discussion, information was obtained that they could solve the problems contained in the LKPD by inserting the number of congklak seeds according to the number asked into each hole. According to group 4, from the results of their discussion, it was concluded that multiples are numbers that are added to the number itself. The teacher asks the students, does anyone want to ask group 4‘‘? According to group 2, they put in the first congklak seeds with the number as asked, but in the next hole they put in a few congklak seeds according to the multiple number asked. The teacher accommodates and provides responses to all discussion results that each group has presented

Figure 6. Students present the results of group discussions

The fourth stage is reflection, students with the teacher`s direction equate perceptions or opinions about multiples of numbers based on the results of joint discussions by accommodating the opinions of each group. The teacher directs students to equate the perception or opinion that multiples can be said to be numbers that can be divided evenly by the number being asked. These numbers, if we look at them together, will be finished if divided by 2. about multiples of numbers. Once finished, the teacher and students discuss the questions together to find out their mistakes in answering.

The following are the results of observations of teacher and student activities as well as data from evaluations of students' mathematical understanding:

Tabel 1. Observation of Activities and Evaluation Results Mathematical Understanding in Cycle I

Observation Aspect	**Percentage (%) achieved**	**Percentage (%) expected**
Teacher Activities	77%	80%
Student Activities	73%	80%
Mathematical Understanding Evaluation Results	61%	80%

The implementation of the cycle I research certainly has positive impacts and shortcomings. The positive impact of the learning process using an ethnomathematics approach is; (1) students become more active in learning, although not all do so (2) students understand more deeply the material being studied through the activity of playing congklak, (3) students learn to build their own knowledge about the concept of multiples, multiples of association, and least common multiple (KPK), so that they obtain meaningful learning.

Meanwhile, the shortcomings that occurred in cycle I learning were; (1) students have not been actively involved in group work activities or during presentations, (2) some students lack a sense of responsibility or do not contribute to group assignments, (3) there are still students who joke around during the learning process (4) there are still some students who are still confused about using the congklak game to discover the concepts of multiples, common multiples, and least common multiples (KPK) because of limited time when testing at the mapping stage and the limited number of teaching aids.

Cycle II

In the planning stage, the researcher prepares and organizes what will be done in the research action process in cycle II. The plan prepared by the researcher includes: (1) Compiling (2) Compiling a learning plan for the learning module for the material on factors, common factors and FPB with an ethnomathematics approach; (3) Preparing media, tools and teaching materials that will be used in the learning process; (4) Preparing LKPD that will be worked on by students during the learning process with an ethnomathematics approach; (5) Preparing observation sheets for teacher and student activities with a total of 15 items each which will be assessed by the observer as a reference in assessing and observing the researcher's activities as a teacher in learning activities; (6) A camera as a tool to document the learning process in research activities in the classroom; (7) Implementing improvement plans found in the previous cycle.

Figure 7. Teachers and Students Conduct Cultural Exploration

The second stage is mapping, the teacher presents a concrete form of the marble game and asks students questions. At this meeting, many students began to understand the answer to the question, namely using the marble game to find factors, common factors, and FPB of a number. There are only 5-10 people who have not been able to understand the meaning of the questions given and how to use the marble game to find factors, common factors, and FPB of a number.

The third stage is explanation, the teacher changes groups in cycle I. At this meeting, groups are made based on the results of discussions with the teacher and the shortcomings in the previous cycle I am meeting. Each group begins to discuss orderly and well through the marble game to predict the possible results of the problem and gain a deep understanding of the factors, common factors, and FPB of a number.

Figure 8. Students in Groups Play Bekel Ball

The fourth stage is reflection, students with the teacher's direction equate their perceptions or opinions about the concept of number factors based on the results of a joint discussion by accommodating the opinions of each group "children, thank you for the results of the discussion, I really appreciate your cooperation. OK, we will discover and understand together what factors, common factors and FPB are." The teacher explains the opinions of each group again and asks the group to pay attention to the results of their work. The teacher asks the students to try the bekel ball game again to find the factors, common factors and FPB of a number. Based on the trials carried out again, many students have begun to discover the concept of factors, common factors and FPB of a number. There are 6-10 students who think that factors are numbers that can completely divide a certain number. For example, the factors of 12 consist of 1,2, 3, 4, 6, 12 which can completely divide the number of 12. The teacher confirms. Then, students also work on questions individually to find out the extent of their mathematical understanding of number factors. Once finished, the teacher and students discuss the questions together to find out their mistakes in answering.

The shortcomings made or findings in cycle I have been corrected by researchers in cycle II.

Table 2. Observation of Activities and Evaluation Results Mathematical Understanding in Cycle II

Observation Aspect	Percentage (%) achieved	Percentage (%) expected
Teacher Activities	96%	80%
Student Activities	92%	80%
Mathematical Understanding Evaluation Results	87%	80%

Based on the analysis results obtained, the aim is to determine the increase in mathematical understanding in mathematics learning through the ethnomathematics approach for class V-B SDN Cipinang 03. The application of the ethnomathematics approach has a positive impact in increasing students' mathematical understanding. The results of cycle II show that students' ability in understanding mathematics reached 87% of the predetermined target, namely 80%. As well as monitoring the actions of teachers and students, reaching 96% and 92% of the target set at 80%. Data from research on improving students' mathematical understanding by applying an ethnomathematics approach can be seen in table 3.

Table 3. Research Data for Two Cycles

Cycle	Percentage		
	Mathematical Understanding	Ethnomathematical Approach	
		Teacher	Student
Cycle I	61%	77%	73%
Cycle II	87%	96%	92%

Based on the evaluation results, it was found that 61% or 19 students were able to find mathematical concepts and the reasons why the concept was found, so that they were able to provide examples and non-examples, apply them in simple calculations, apply them to problem solving, present concepts in mathematical representations (pictures, tables, diagrams, etc.), and relate them to various other mathematical concepts. Meanwhile, 39% or 12% of students still had difficulties in several aspects such as applying concepts in problem solving, presenting concepts in mathematical representations, and relating them to various other mathematical concepts.

DISCUSSION

The increase in mathematical understanding is influenced by the application of the ethnomathematics approach. There are positive and negative impacts from each meeting held in the cycle I am learning, namely that students understand more deeply the material being studied and build their own knowledge about mathematical concepts through playing activities so that they obtain meaningful learning. In accordance with Garvis' opinion, one way to achieve the correct understanding of concepts is through games, so that students can interact directly regarding a mathematical concept (Radiusman, 2020). Third, not all students are able to understand the use of the traditional congklak game in discovering the mathematical concepts being studied and the reasons why these concepts were discovered. So, in cycle II the teacher guides students more slowly in discovering and understanding the mathematical concepts being studied, by providing more traditional game props than in cycle I. The child should have a deep understanding of a concept and understand the reasons why the concept is found, rather than just memorizing the formula. Skemp believes that the understanding that students should have is that they are able to understand how a mathematical concept is applied and the reasons behind its application (Skemp, 1976). Fourth, students pay less attention when the teacher provides information, and the teacher does not focus the students' attention.

At the cycle II meeting, several positive things were also found which were advantages and negative things which were disadvantages. The positive impact of applying the ethnomathematics approach in cycle II is that students pay more attention to the discussions given because they are all actively involved in every learning activity. All students are given motivation to ask questions, answer or give opinions to their friends. Apart from that, all students can understand and understand the use of ethnomathematics of congklak and bekel ball games to discover the mathematical concepts being studied. So that the results of the evaluation of mathematical understanding, which previously in cycle I had not reached the expected target, have now exceeded the target. There were still 4 students who obtained scores less than the complete criteria, namely JFP, GAA, SMA and SANK. Then, the researcher carried out an analysis of the three students based on their previous grades and discussed them with the class teacher. As for the results of the analysis of previous scores, information was obtained that these 3 students were indeed included in the minimum category in mathematics subjects because these students' abilities could be said to last longer in managing and applying the information provided by the teacher. This is in accordance with the opinion expressed by Aunurrahman that one of the factors that influences mathematical understanding is the difference in cognitive abilities possessed by each student (Aunurrahman, 2013).

This shows that the application of the ethnomathematics approach, if implemented according to the correct and complete stages, will influence increasing students' abilities, especially. Turmudi (2018) in his research "Mathematics Education and Cultural Integration" showed that the implementation of ethnomathematics in a structured manner can improve students' mathematical problem-solving abilities by up to 27% compared to conventional learning. Wahyuni, A., Tias, A. A. W., & Sani, B. (2020) in "The Role of Ethnomathematics in Building National Character" concluded that the ethnomathematics approach implemented through systematic stages has a significant effect on students' critical thinking and mathematical communication skills. Supriadi, Arisetyawan, A., & Tiurlina (2019) stated that the integration of ethnomathematics in mathematics learning that follows the stages of exploration, elaboration, and confirmation can improve students' understanding of mathematical concepts by 32%. Rosa, M., & Orey, D. C. (2021) in "Ethnomathematics: Teaching and Learning Mathematics from a Cultural Perspective" proves that the ethnomathematics approach applied completely through the stages of identification, exploration, interpretation, and development can improve students' mathematical representation abilities. Umbara, U., & Suryadi, D. (2019) through their research on the implementation of ethnomathematics found that students who learned with the ethnomathematics approach showed a significant increase in mathematical connection abilities and mathematical dispositions. Rakhmawati, R. (2020) concluded that the application of ethnomathematics carried out through the stages of introduction, exploration, association, and application was able to improve students' mathematical reasoning abilities by 36% compared to the control class. Irfan, M., Setiana, D. S., & Kuswanto, H. (2022) proved that structured ethnomathematics-based learning can improve students' mathematical literacy and high-level thinking skills. Widada, W., Herawaty, D., & Lubis, A. N. (2019) in their research showed that students who learned mathematics through an ethnomathematics approach experienced a significant increase in mathematical modeling abilities and self-efficacy.

The application of ethnomathematics approach is considered effective to improve students' mathematical understanding, because in traditional games of congklak and bola bekel, a deep understanding is needed to be able to find, draw conclusions, apply mathematical concepts obtained in solving problems, and relate these concepts to various other mathematical concepts. In addition, through this game, students also learn the reasons why a mathematical concept was discovered and applied. The ethnomathematics approach also makes students play a more active role in learning and gain meaningful learning experiences through playing activities.

CONCLUSION

Based on the results of classroom action research conducted at elementary school Cipinang 03, it was concluded that there was an increase in the mathematical understanding of class V-B students in mathematics subjects. The implications of the study include enriching the literature on alternative mathematics learning approaches related to the Indonesian context,the ethnic approach can be used as an alternative for interesting and reasonable learning methods that combine mathematics with students' daily lives and culture, promoting curriculum development that integrates local cultural elements into mathematics learning, context-related learning, interest in mathematics learning, and strengthening cultural identity, Curriculum Developers: providing input for compiling mathematics learning materials related to the Indonesian cultural context. The need to develop mathematics education materials that integrate the local Indonesian cultural context. Strengthening students' cultural identity through learning that recognizes mathematical values in everyday cultural practices.

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