

## FOSTERING STUDENTS' INTEREST IN MATHEMATICS LEARNING WITH THE UTILIZATION OF ETHNOMATHEMATICS THROUGH MAKKUDENDENG TRADITIONAL GAME

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### Abstract:

Interest in learning is one important factor that determines student success in learning. Low student interest in learning is associated with their ability to master the concept of summing whole numbers. This study aims to foster students' interest in learning mathematics through *makkudendeng* traditional game. The research method is design research starting from the preliminary design, design experiment, and retrospective analysis. The research subjects were students in grade II Primary School. The results of this study conclude that the *makkudendeng* traditional game, which is used as a learning resource in learning the addition of whole numbers, has relevance to the indicators of learning interest, which include: pleasure in learning, interest in learning, attention, and involvement in learning. It is because students learn while playing. So, the *makkudendeng* traditional game can be a solution to foster students' interest in learning mathematics.

**Keywords:** Culture, Ethnomathematics, Interest in Learning, *Makkudendeng* Traditional Game

## MENUMBUHKAN MINAT BELAJAR MATEMATIKA SISWA SEKOLAH DASAR DENGAN PEMANFAATAN ETNOMATEMATIKA MELALUI PERMAINAN TRADISIONAL MAKKUDENDENG

### Abstrak:

Minat belajar merupakan salah satu faktor penting yang menentukan keberhasilan siswa dalam belajar. Rendahnya minat belajar siswa berasosiasi dengan kemampuannya dalam menguasai konsep penjumlahan bilangan cacah. Penelitian ini bertujuan untuk meningkatkan minat belajar matematika siswa melalui permainan tradisional *makkudendeng*. Metode penelitian adalah *design research* yang dimulai dari desain pendahuluan, percobaan desain, dan analisis hasil. Subjek penelitian adalah siswa kelas II Sekolah Dasar. Hasil penelitian ini menyimpulkan bahwa permainan tradisional *makkudendeng* yang dijadikan sebagai sumber belajar dalam pembelajaran penjumlahan bilangan cacah memiliki relevansi dengan indikator minat belajar, yang meliputi: perasaan senang dalam belajar, ketertarikan untuk belajar, penuh perhatian, dan keterlibatan dalam belajar. Hal ini disebabkan karena siswa belajar sambil

bermain. Oleh karena itu, permainan tradisional *makkudendeng* dapat menjadi salah satu solusi untuk menumbuhkan minat belajar matematika siswa.

**Kata Kunci:** Budaya, Etnomatematika, Minat Belajar, Permainan Tradisional *Makkudendeng*

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## INTRODUCTION

Learning interest is a mental expression of encouragement to learn something with full awareness, pleasure, and discipline (Arthur, Oduro, & Boadi, 2014; Voinea & Purcaru, 2014). Interest in learning is an affective aspect that can affect student achievement (Aras, 2016). Students' interest in participating in the learning process will be better if related to students' daily activities (Tandililing, 2013; Prahmana, 2015; Zahrawati & Aras, 2020). Teaching mathematics by bringing students into their daily activities in the form of culture is one of the studies of mathematics called ethnomathematics (Risdiyanti & Prahmana, 2020; Supiyati, Hanum, & Jailani, 2019).

The existence of cultural diversity in Indonesia encourages researchers to study it. Sirate (2012), Hartoyo (2012), and Tandililing (2013) conducts research and development of integrated ethnomathematics teaching materials and concludes that the role of ethnomathematics is significant as a means of fostering student interest in learning, motivating, stimulating students, overcoming boredom, and providing new nuances in learning mathematics. This is because students already know ethnomathematics.

Efforts to implement ethnomathematics in mathematics learning will create new nuances because, so far, mathematics lessons have become an abstract concept that is not related to daily activities (Anwas, 2011; Maryati & Prahmana, 2019; Risdiyanti, Prahmana, & Shahrill, 2019). In addition, the mathematics that students learn in school is not directly related to their life patterns. It does not contain practical values in society, making mathematics a subject that is not easy for students to understand because students acquire two concepts, namely concepts obtained in the environment and concepts obtained in school (Muslimin, Ilma, Putri, & Aisyah, 2020). This is thought to be a factor causing students to find it difficult to learn mathematics and leading to low

interest in learning. Students' difficulties in applying mathematics in everyday life are because students perceive mathematics as abstract knowledge (Fitri & Prahmana, 2020; Risdiyanti & Prahmana, 2020). Therefore, in learning mathematics, a learning resource that can teach mathematics to students is needed to be more concrete. One of them is by utilizing the traditional game, namely *makkudendeng*.

The *makkudendeng* traditional game in Indonesian is known as *engklek* game. This game is one of Indonesian culture that children often play using a *bacu-bacu* (the small stone), so that this traditional game is very familiar among children. By utilizing this traditional game, students will understand the direct relationship between the formal mathematics they learn in school and its relation to everyday life (Hendriana, Prahmana, & Hidayat, 2019; Febriyanti, Prasetya, & Irawan, 2018). Through this process, they feel happy, attentive, and actively learning. This has implications for increasing students' interest in learning mathematics (Adhetia & Suhartini, 2018). In addition to helping students understand the various mathematical concepts taught in schools, bringing the *makkudendeng* traditional game into the learning process is an attempt to introduce the diversity of Indonesian culture, which is slowly being eroded by modernization. The use of ethnomathematics through the *makkudendeng* traditional game can foster the noble values of the nation, namely: a sense of responsibility, respect, tolerance, hard work, discipline, confidence, and honesty (Pebryawan, 2018). So that there will be a sense of pride and love for the country.

In learning mathematics through the *makkudendeng* game, there is a geometric pattern in which there are numbers 1 to 10. This game begins with the activity of the students throwing a *bacu-bacu* followed by the students jumping on the game box while counting each number in the geometric shape they are stepping on. After arriving at the box where the punters were, the students were asked questions by the teacher about the addition of whole numbers in relation to local culture (Prihastari, 2015). If the student reaches point 10, he will turn his back on the *makkudendeng* playing field and throw a *bacu-bacu*. To get the box, students are required to answer the story questions given by the teacher.

From the game process, students will be motivated in the learning process and easily understand the material as some previous studies have shown that the use of the traditional *makkudendeng* game as a learning resource has a good effect on students' motivation in understanding the learning material (Fitriyah & Khaerunisa, 2018; Prihastari, 2015; Pebryawan, 2018; Hendriana,

Prahmana, & Hidayat, 2019; Risdiyanti & Prahmana, 2020). This encourages researchers to use the *makkudendeng* traditional game as a learning resource in fostering interest in learning mathematics for elementary school students. Therefore, this study aims to foster interest in learning mathematics in elementary school students by utilizing ethnomathematics through *makkudendeng* traditional game.

## METHODS

This study is design research which is thought to be able to answer the problems in this study. Design research aims to find student learning trajectories by working with subject teachers to build a new theory in developing learning methods (Prahmana, 2018). This research method includes preliminary design, experimental design, and results analysis. The preliminary design stage is that the researcher compiles a learning design prototype according to the student's needs for their learning trajectory (the hypothetical learning trajectory). The design experiment stage is to teach students learning methods that have been designed before. If the design of the learning method is not in accordance with the needs of the students as a whole, then revise it again until it finds a design that suits the needs of the students and in the end, a new theory is obtained. The final stage is the analysis of the student learning interest data and student learning outcomes. The following shows the design research stage in figure 1.

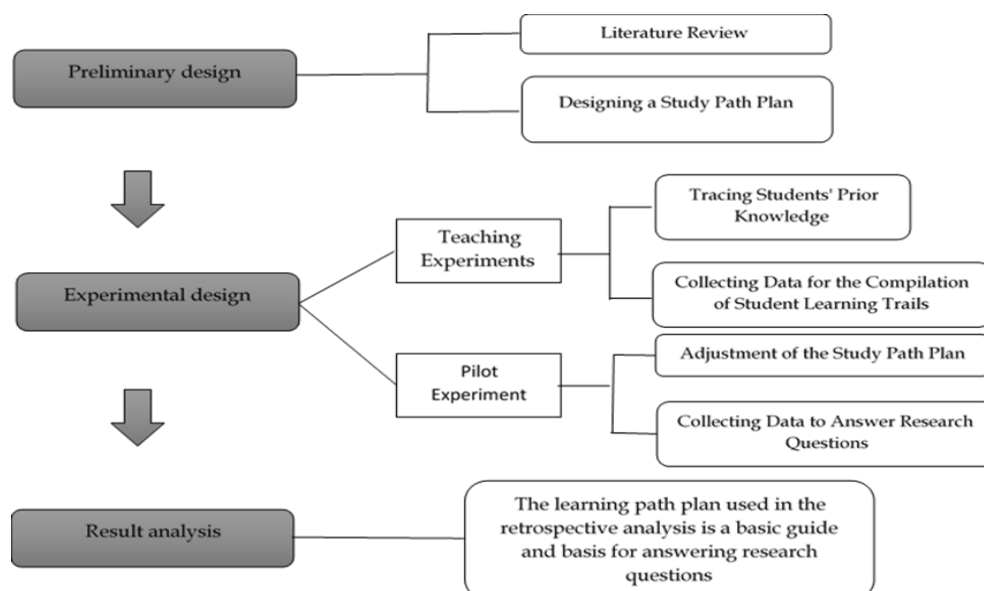


Figure 1. Design Research Phase (Prahmana, 2018)

Data collection used a questionnaire of interest in learning and learning outcome tests. A questionnaire was given to measure student interest in learning. A test of learning outcomes was given to determine the level of student understanding of the summing operation after learning mathematics by utilizing the *makkudendeng* traditional game activity. This research was conducted at SD Negeri 30 Mappadaelo in grade II students, with 20 students consisting of 9 male students and 11 female students.

## RESULTS AND DISCUSSION

The learning process uses ethnomathematics through the *makkudendeng* traditional game in 3 stages: preliminary design, experimental design, and retrospective analysis.

### 1. Preliminary Design

In the preliminary design stage, the first thing to do is conduct a literature review such as books and journals about the *makkudendeng* traditional game used as a learning resource in learning the addition of whole numbers. Furthermore, the researcher made observations at SDN 30 Mappadaelo to see the state of the school, the condition of the students, and the games that will be used as a learning resource. Finally, researchers designed the learning method. The game activities performed by students during the learning process by utilizing the *makkudendeng* traditional game. First, make the *makkudendeng* playing field in geometric shapes using chalk or small wood to draw the *makkudendeng* field, as shown in figure 2.

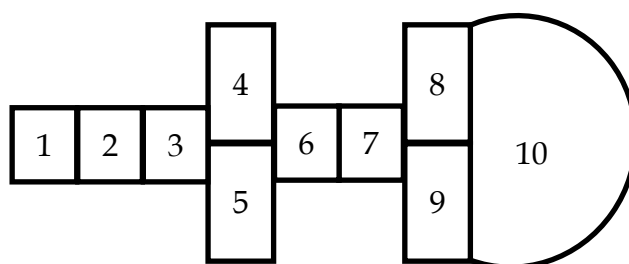


Figure 2. *Makudendeng* Field

Second, the student throws a *bacu-bacu* into the number one box, and the student jumps with one leg over all the other boxes while counting the numbers in the box. After the students returned to box number one to pick up a *bacu-bacu* that was thrown, the students had to answer the teacher's questions regarding the addition of whole numbers that were connected to the local culture. If the

question is answered correctly, then the box belongs to him and starts the next game by throwing the humpback at box number two. If a *bacu-bacu* go into the box, questions are asked about the addition of whole numbers related to culture. The box that contains a *bacu-bacu* player's cannot be trampled on. The game ends when a player has passed through boxes 1-10 safely. The winner of the *makkudendeng* traditional game is the one who collects the most boxes. The level of the ethnomathematics based on the *makkudendeng* traditional game is described in table 1.

Table 1. Levels of Ethnomathematics Based on the *Makkudendeng* Traditional Game

Level	Description
First	The student starts the game by throwing a <i>bacu-bacu</i> into box number 1 and counting every number he passes until it returns again.
Second	Before the student picks up a <i>bacu-bacu</i> that was thrown, the student must answer the teacher's questions about adding whole numbers.
Third	If a <i>bacu-bacu</i> enter the next box, student was entitled to get questions from the teacher about story questions related to culture.

The teacher always associates ethnomathematics with the concept of adding whole numbers and at the end of the game is asked to mention the character values obtained from the *makkudendeng* traditional game, which include a sense of responsibility, respect, tolerance, hard work, discipline, confidence, and honesty. The following are presented the questions given to students at each level in table 2.

Table 2. Questions Given to Students at Each Level

Level	Description
First	1, 2, 3, ....., 10
Second	1 <i>lipa sabbe</i> (silk sheath) plus 1 <i>lipa sabbe</i> equals 2 <i>lipa sabbe</i> . The <i>lipa sabbe</i> here symbolizes local culture (question in the game)
Third	At the <i>mabbarasanji</i> event, in 1 tray, there are 5 <i>onde-onde</i> cakes, 7 <i>jompo-jompo</i> cakes, 3 <i>dokko-dokko</i> cakes, and 5 <i>bandang</i> cakes. How many cakes are in 1 tray?

## 2. Design Experiment

In the design experiment stage, the teacher taught instructional design that has been developed previously. Before starting the learning process, the

researcher gave a pretest to determine the students' initial abilities and gave a questionnaire of interest in learning to obtain initial data about students' interest in learning mathematics. The questionnaire results on students' interest in learning mathematics were given information that from the four indicators of measured interest in learning, three of them were in a good category, namely: pleasure in learning, interest in learning, attention, and involvement in learning. The low interest of students in learning mathematics has an impact on their learning outcomes. From the results of the pretest given, it was obtained data that the students' ability to complete the addition of whole numbers was still very low because among the 20 students who took the test, 14 students got a score of 0-54 and some of them even got a score of 0 and could not counts from the numbers 1-10. So that researchers guide students so that they can understand the introduction of counted numbers.

In the early part of the lesson, the teacher conveys the game rules and makes 4 playing fields of *makkudendeng*. Furthermore, the teacher divides students into five groups which in one group consists of 4 students to foster an attitude of cooperation, tolerance, and mutual respect for fellow students. The lesson begins by explaining the basic concepts of natural numbers (counting, comparing numbers, place values, and addition) and continues with the *makkudendeng* traditional game. Each student in the group is asked to play the *makkudendeng* field that has been made to fight other groups. After the game is over, students are asked to return to their original group to count how many boxes they have. The winner in the game is the group that gets the most boxes. The *makkudendeng* traditional game makes it easier for students to add up whole numbers because in the game process before the student answers the question, he jumps up and down all the boxes in sequence and counts each number on the squares that are stepped on. Students will find it easier to answer questions because the questions are associated with student activities in everyday life. The last activity was for students to be given assignments to complete at their homes to deepen their knowledge of the addition of whole numbers. After learning 3 times using the *makkudendeng* traditional game, students are given a posttest to determine the level of students' understanding of the counting material and continued with a questionnaire on learning interest to determine students' interest in the learning process by utilizing the *makkudendeng* traditional game.

The student's ability to understand the concept of the addition of whole numbers by utilizing the traditional *makkudendeng* game activities was described based on the pretest and posttest results. From the data processing

results, grouped into 5 categories, the frequency distribution and percentage are obtained as in table 3.

Table 3. Descriptive Statistics of the Students' Ability to Understand the Concept of Addition of Whole Numbers

Interval	Categories	Pretest		Posttest	
		Frequency	(%)	Frequency	(%)
90-100	Very high	0	0.00	5	25.00
80-89	High	0	0.00	7	35.00
70-79	Moderate	2	10.00	6	30.00
55-69	Low	4	20.00	2	10.00
0-54	Very low	14	70.00	0	0
Total		20	100	20	100

Source: processed data

Table 3 shows that the students' initial ability to understand the concept of the addition of whole number operation is still classified as very low by looking at the results of the pretest. After the learning process with the use of ethnomathematics through the *makkudendeng* traditional game, there was an increase in students' ability to understand the concept of the addition operation of the whole number based on the posttest score.

Data on a student learning interest during the learning process by utilizing the *makkudendeng* traditional game activities were collected through a learning interest questionnaire. Questionnaires were given before mathematics learning and after mathematics learning to determine whether there were differences in student interest in learning before mathematics learning and after mathematics learning through the *makkudendeng* traditional game. Data on student learning interest can be seen in table 4.

Table 4. Descriptive Statistics of Student Learning Interests

Indicator	Before Learning			After Learning			Increase (%)
	$\bar{x}$	%	Categories	$\bar{x}$	%	Categories	
Pleasure in learning	3.50	59.60	Good	4.72	82	Very good	22.4
Interest in learning	3.20	62.20	Enough	4.81	85.20	Very good	23
Attention	3.00	60.80	Enough	4.25	79.50	Good	18.7
Involvement in learning	2.90	56.70	Enough	4.50	86.35	Very good	29.65

Source: processed data



Table 4 shows an increase in each indicator of student interest in learning before and after learning. Overall, students' interest in learning mathematics using ethnomathematics through the *makkudendeng* traditional game is in the very good category. This is because, in the learning process, students learn while playing.

### 3. Retrospective Analysis

In the retrospective analysis stage, the researcher analyzed the data obtained from a learning outcome test and a learning interest questionnaire. The traditional game of *makkudendeng* is a learning resource in the learning process that will help students understand the addition and subtraction of whole numbers. Students are able to understand that adding whole numbers is adding a number to another number or continuing to count the number added with another number. So adding two numbers, for example, 9 plus 2, is the same as continuing to say the number 9 with the number 2 so that the answer is 11. Students learn that there is an association with nine members and then combine it with an association with two members, then a new set has 11 members, which can be abstracted into  $9 + 2 = 11$ .

The ability of students to understand the addition of whole numbers becomes better after the learning process by utilizing the *makkudendeng* traditional game. As shown from the results of the posttest students are in the good categories and very good categories. This is because students learn while playing. The learning process using the *makkudendeng* traditional game is in accordance with the law of exercise in the theory of Thorndike (1994), which states that an activity that continues to be accustomed to, the stronger the relationship. This theory is reinforced by the theory of Vygotsky (1997), which states that the main factor that is very important in students' understanding of learning is the child's social environment, where children learn more easily through songs, games, and arts. Students already understand something that comes from their environment, so that if the learning is presented using this method and approach it will make it easier for students to understand the addition of whole numbers. Changes in students' understanding ability in adding whole numbers in this study were not obtained directly, but were obtained through a fun playing activity. So that it can increase student interest and activeness in learning.

The *makkudendeng* traditional game is very effectively implemented as a source of student learning because it can eliminate student boredom in learning

and foster student interest in learning. In the *makkudendeng* game, children are taught to have a sense of responsibility, respect, tolerance, hard work, discipline, self-confidence, and honesty. The *makkudendeng* traditional game can also train children's intelligence, including naturalist, interpersonal, and kinesthetic intelligence (Pebryawan, 2018). This is in line with the research of Risdiyanti, Prahmana, and Shahrill (2019); Prahmana (2015); Fitriyah and Khaerunisa (2018); Prihastari (2015); Risdiyanti and Prahmana (2020) that games that are used as learning resources can help students improve the quality of their learning. Mathematical concepts that can be taught through traditional games include geometry, number operations, functions, and comparisons (Adrelia, Kurniawati, & Prahmana, 2015; Zahrawati, 2020).

From the results of the student interest questionnaire given after the learning process, it was found that all indicators of measured interest in learning, namely: pleasure in learning, interest in learning, attention, and involvement in learning, have increased. The largest percentage increase before learning and after learning was in the indicator of involvement in learning, with 29.65%. The smallest percentage increase before and after learning was in the indicator of attention with 18.70%. Overall, students' interest in learning mathematics using ethnomathematics through the *makkudendeng* traditional game is in the very good category. This is because, in the learning process, students show high enthusiasm for learning. This game invites students to learn from something close to their world. Increased understanding of students in the addition of integers is positively correlated with higher student interest in learning (Arthur, Oduro, & Boadi, 2014; Voinea & Purcaru, 2014). This is also supported by the results of Sirait's research (2016), which concluded that there was a significant influence between interest in learning and student achievement of 0.706 with a termination coefficient of 49.8%, which means that the influence of student interest in learning achievement was 49.8%.

These results are also reinforced by research findings by Abi (2016), which concluded that ethnomathematics frees the paradigm that mathematics is scary because the process is fun, thus creating student interest in learning. In addition, ethnomathematics also provides messages and affective competencies, namely creating a sense of nationalism, love for the country, pride, and respect for the legacy of ancestral traditions in the form of art and culture.

## CONCLUSION

Ethnomathematics through the makkudendeng traditional game as a learning resource can foster students' interest in learning mathematics which includes a feeling of pleasure in following the learning process, an interest in learning, involvement in learning, and being attentive. This is because students learn while playing. This game invites students to learn from something close to their world so that learning becomes fun, making students interested and active in learning.

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