Ethnomathematics in mathematics, social and physical education

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Abstract. Phenomenon the current problem of children in the world, including Indonesia, is not familiar with the benefits of traditional games so that it has an impact on the lack of mathematical achievements, social interactions and physical activity of elementary school students. The purpose of this paper is to examine the development of mathematical understanding, social and physical abilities of grade IV students in elementary school through Sundanese ethnomathematics learning. Thirty-seven students in the experimental class and thirty-eight students in the control class participated in a quasi-experimental design. The instruments used were tested, interviews, observation and documentation. The results showed that the experimental class's mathematical comprehension ability was better than that of the control class, the formation of social interactions between students, and students-teachers, making students involved in activities so that the learning atmosphere felt pleasant, interesting, and healthy for the students' bodies. Sundanese ethnomathematics learning with engklekmatica games has proven to be useful for elementary school students because it can develop the mathematical, social and physical abilities of elementary school students.

1. Introduction

The impact of globalization that occurs is the loss of several important elements in the lives of our people, namely: the indigenous culture of a region, a sense of nationalism, patriotism, the nature of kinship and mutual cooperation, confidence and the formation of a lifestyle that is not in accordance with our customs and erosion of cultural values [1]. Weakened indigenous culture and even destruction is Sundanese culture [2], one of the products of Sundanese culture is the traditional game engklek [3] currently many children have forgotten [4]. This game can be used to overcome the low achievement of mathematics [5, 6], lack of habituation of social interaction in learning [7] and not optimal physical activity of students in elementary school [8]. One of the innovations in mathematics learning that can be used to preserve the Sundanese culture of extinction is by using ethnomathematics learning. Gerdes [9] states that ethnics are practice by a Circumstance cultural group, labor / farmer group, children in particular social class, professional class, etc. This support that ethnomathematics is not pure talk about a particular ethnic group. Mathematics teaching needs to be scaffolded daily that is based on local culture and school mathematics. Ethnomathematics is a mathematics that grows in a particular culture, and as an option in the development of mathematics teaching materials that are more dominated by conventional methods and not contextual [10]. Beginning with its presentation by Ubiritan D’Ambrosio, ethnomathematics has been a prominent sub field of math instruction research [11]. Mathematics learning with ethnomathematics-based SAVI approaches influence to mathematical communication skills of students [12]. Among students' mathematical modeling capabilities who get
ethnomathematics-based contextual learning better than students who do not [13]. Ethnomathematics learning can be related to other disciplines, such as culture and social society [14], socio-cultural [15] and music [16]. Ethnomathematics learning can be introduced in elementary schools with a focus on cognitive students [17]. So, this paper wants to display learning ethnomathematics with different relationships, namely between mathematical, social and physical comprehension abilities.

Innovation in ethnomathematics learning developed this paper is Sundanese ethnomathematics learning by modifying the Sundanese culture so that it is consistent with the concepts in mathematics learning. The Sundanese concept of learning ethnomathematics in this study developed [6] by using Sundanese engklek play ideas which were modified with long units of measure developed with the thought process of mathematical understanding ability. In addition, the game played a role in social development [18] and physical children [19]. Mathematics learning in elementary schools will be more interesting if you use a game of engklek (engklekmatika) which is modified in understanding unit length. Research problems are formulated in the following questions: 1. How is the comparison between the development of mathematics, social and physical understanding among elementary school students who use Sundanese ethnomathematics learning with engklekmatika compared to conventional learning. The purpose of this study is to examine the development of mathematical understanding, social and physical abilities of fourth grade students in elementary school through Sundanese ethnomathematics learning in mathematics. The expected benefits of this research are for teachers, students, policy makers, Sundanese cultural observers, and researchers

2. Methods
The research method used in this study was quasi-experimental with posttest only control group design consisting of two groups: 37 students in the experimental and 38 control class students in elementary schools in Indonesia. Design posttest only control group as follows:

The experimental class is a class that uses Sundanese ethnomathematics learning with a game of engklekmatika while the class is a class that receives conventional learning. The instruments used were tested to see the comparison of the ability of mathematical understanding between experimental and control classes, interviews were used to collect data about the impression of Sundanese ethnomathematics learning with engklekmatika, observation was used to collect data about students' mathematical, social and physical understanding both experimental class and control class. Documentation is used to view learning processes and results. The data to be analyzed in this study are data from the students' mathematical comprehension test then tested for normality, homogeneity and mean test using the Kolmogorov-Smirnov, Levene, and t-test or Mann-Whitney test. Non-test data for social and physical abilities were analyzed qualitatively by using interview data, observation and documentation.

3. Results and discussion
3.1. Analysis of data post-test the ability to understand mathematics
In this section, we describe the analysis of post test data. In this study, post test data was taken after 1 week of learning. In table 1, the results of the normality test in the experiment and the control class test was tested with SPSS 17.0.

| Class    | Statistic | df  | Sig  |
|----------|-----------|-----|------|
| Experimental | 0,126     | 37  | 0,145|
| Control   | 0,139     | 38  | 0,063|

Based on table 1 shows normality test in the experimental and control class that is significant value of experimental class = 0.145, and control class = 0.63. Both of the significant values are more than 0.05, so the sample data is of two classes said to be normally distributed. Test the homogeneity of variants from both classes using the Levene's test with SPSS 17.0. The homogeneity
variant test results are significant = 0.501. Significant value is more than 0.05 then the data from both classes has the same variant. Table 2 describes the results of the t test with SPSS 17.0 to analyze whether there are differences in the experimental and control classes.

| Class      | N  | Mean | SD  | t-value | df  | Sig   |
|------------|----|------|-----|---------|-----|-------|
| Experimental | 37 | 12.21| 1.90| 6.559   | 73  | 0.000 |
| Control    | 38 | 9.10 | 2.19|         |     |       |

The results in table 2 get a sig value of 0.000. Sig value less than 0.05, so there is a difference in the final test of the experimental and control class. Based on the average value obtained, it is said that the ability of students' mathematical understanding in the experimental class is better than the control class.

3.2. Observation data on social ability
This section presents observations of social abilities that occur in learning for one week with one class teacher observer and one social science lecturer. Table 3 presents the results of the social ability of the experimental and control classes with the number of students doing an indicator divided by the total students then multiplied by one hundred percent.

| Indicator | Observer 1(E) | Observer 2(E) | Observer 1(C) | Observer 2(C) |
|-----------|---------------|---------------|---------------|---------------|
| Share mathematical ideas | 80%           | 80%           | 60%           | 60%           |
| Following the teacher’s instruction | 90%           | 80%           | 80%           | 70%           |
| Appreciate friends | 90%           | 90%           | 70%           | 70%           |
| Help Friends | 80%           | 85%           | 70%           | 70%           |
| Control Emotion | 80%           | 80%           | 70%           | 70%           |
| Conveying opinion about mathematics | 80%           | 80%           | 50%           | 50%           |
| Receive opinions about mathematics | 75%           | 80%           | 60%           | 60%           |

The results in table 3 get the value of the number of student participation in each indicator for the experimental class is always higher than the control class. Based on the student participation value obtained, it is said that the social skills of students in the experimental class are better than the control class.

3.3. Physical ability observation data
In this section presented observations of physical abilities that occur in learning for 1 week with observers of one class teacher and one lecturer in physical education. In table 4 presented the results of the physical ability of the experimental class and control with the presence or absence of physical activity in learning to understand mathematical concepts.
Table 4. Results of observation of physical abilities of experimental and control classes.

| Indicator                                      | Observer 1(E) | Observer 2(E) | Observer 1(C) | Observer 2(C) |
|------------------------------------------------|---------------|---------------|---------------|---------------|
| There is running activity in understanding mathematical concepts | High          | High          | Low           | Low           |
| There is jump activity in understanding mathematical concepts    | High          | High          | Low           | Low           |

The results in table 4 explain that observation of physical ability activities for the experimental class is always higher than the control class. Based on observations of student participation obtained, it was said that students' physical skills in the experimental class were better than the control class.

The results of the study showed that the ability of mathematical, social and physical understanding of elementary school students through Sundanese learning ethnomathematics by playing games is more effective than conventional learning in unit length material. This finding is in accordance with the opinion [20] that ethnomathematics learning greatly impacts on learning motivation and student mathematics learning achievement. This learning begins with students constructing mathematical knowledge with Sundanese culture, then there is a questioning situation about playing games, then students look for answers by playing and learning together, this activity will become a mathematical model associated with the concepts learned, after which students together with the teacher, it reflects the activities of the game. Based on these steps, it proves the effectiveness of this learning. Because learning with the game engklematika by modifying the game engklematika with mathematical concepts makes it easier for students to remember, understand and do calculations in material unit length, because learning mathematical concepts supported by student activities will be easy. This is in accordance with the opinion [21] that learning activities are very influential on student learning outcomes communication mathematics. Sundanese culture is introduced to help students construct students' knowledge with mathematics so that students become confident in learning mathematics, according to interview data to students, Sundanese ethnomathematics learning with mathematics makes them confident in learning mathematics, because this game is easy to do again at home with friends. Student confidence will be comparable to student achievement has also been proven [22]. Game play also encourages student interaction in sharing ideas in learning mathematics, because this game is done together, students also diligently always pay attention to the teacher's instructions in implementing this game, students always respect other friends in waiting for the game to be adjusted to questions that students do. Helping friends if there are difficulties, one student jumps into each field, the other helps record the answers obtained. Discipline students do not scramble in waiting for the part in playing music. Each student completes one problem with the game playing, then confidently conveys the answer in front of the class. Other students with a heart are happy to listen to their friends' answers. These activities are the students' social abilities that arise in Sundanese ethnomathematics learning with the game crunch, so the game is very influential on students' social abilities, this is supported by research [23]. Based on the data of this study it can be stated that the higher the students' social abilities will affect the results of mathematics learning. This finding [24], that skill activities have a significant effect on mathematical communication skills.
The game also contains activities of physical movements such as walking and jumping. Students while walking understand the mathematical concepts of unit length from one box to another, the other students take turns running alternately by adjusting the questions asked in the student worksheet. The other movement is jumping from one box to another, jumping from a unit of length to another unit of length with a happy and cheerful heart, in accordance with observations and interviewees, all students express their pleasure in learning mathematics with this game. Physical ability can have an effect on achieving learning achievement on mathematical understanding, the spirit of learning, not quickly saturated, this is in accordance with the interview data of students in Sundanese mathematics learning. This finding that physical ability in this case psychomotor resulting from the application of Teaching learning in schools can affect learning achievement, intellectual development, commitment, enthusiasm and learning success.

4. Conclusion
The learning of Sundanese ethnomathematics with the game of mathematics in learning the learning units in elementary school proved effective. Effective learning steps in involving students’ knowledge between Sundanese culture and mathematics to provide an improvement in students' understanding, social and physical abilities. Based on the results of the study, researchers suggested that Sundanese ethnomathematics learning with a game of mathematics can be used in learning unit length material. The teacher can use learning steps to improve the ability of mathematical, social and physical understanding. Suggestions for Further research is the researcher doing Sundanese mathematics learning with the matrices on other material and to improve other mathematical abilities.

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