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# Ethnomathematics: Exploration in Traditional Games Jambi

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**Abstract**. The study aims to explore the correlation between mathematics and Jambi culture. This research uses etnography approach, that is empirical and theoritical approach to get description and deep analysis about a culture based on the field note which has been obtained from the data collection. The focus of this research is study etnomathematics in Jambi traditional games namely Cingkling, Kembang-kembangan, Kotak Calok, Buah Peci and Gasing Kayu. The result shows that Jambi traditional games have the concepts of mathematics. Such as plane congruence, arithmetic social, measurement, and geometry. In addition, the traditional games also contain cultural Jambi.

**Keywords:** ethnomathematics, traditional games, Jambi culture, ethnography

## 1. Preliminary

According to the PISA (Program for International Student Assessment) data, a three-year evaluation program organized by the Organization for Economic Co-operation & Development (OECD) for the 15 years old students, the age which students close to the end of compulsory education and had obtain sufficient knowledge and skill to participate in modern society (OECD, 2015), it proves that Indonesia has participated in this PISA program since 2000, but the results have not been satisfactory. Indonesia is almost always in low rank. Indonesia's achievement in the Mathematics at the beginning of its participation in 2000 was ranked 39th out of 41 countries. Furthermore, the achievement in the Mathematics in 2003, Indonesia ranked 38th out of 40, and ranked 50th out of 57 countries in 2007, ranking 61 out of 65 countries (Wardono et al., 2015) and in 2012 Indonesia ranked 64 out of 65 countries (Kompas, accessed on 5th December 2013). Indonesia's ranking in 2015 was 63 out of 69 countries evaluated. Indonesia's ranking and average score did not differ greatly from the results of the tests and preliminary PISA surveys in 2012 which were also in the low group.

The study of the Indonesian National Assessment Program (INAP) conducted by the Ministry of Education and Culture in 2016 explained that the Mathematics competencies of elementary school students were totally red. About 77.13% of elementary school students across Indonesia have very low mathematical competencies (less), 20.58% are categorized sufficient, and only 2.29% are categorized as good (Rarasati, 2018). The latest research from the Research Program on Improvement of System Education (RISE) in Indonesia in 2018, shows that students' ability to solve simple Math problems is not significantly different between new elementary school students and those who have graduated from high school.

Looking at Indonesian Student Competency Assessment (AKSI) in 2017, junior high school students were also apprehensive from VIII graders in two provinces. The results of the average Mathematics literacy competency of students were less, 27.51 from a score of 0-100, the assessment results were very

poor. The data from the Indonesian Family Life Survey (IFLS) in 2000, 2007, and 2014 which represented 83% of the Indonesian population were seen from all age groups, also showed a Mathematical emergency. More than 85% students graduated from elementary school, 75% students graduated from junior high school, and 55% students graduated from high school were only able to answer questions with the level of below 2nd graders. Only a few can solve Math problems in the level of 4th grade and 5th grade. In 2000 only 31.8% in elementary school answered correctly,

Emergency is a mathematical ability that does not develop along with the increase in the level of school that is followed by children and the decline that occurs from year to year (Okezone, accessed on 11th October 2013). In relation to these results, the educators are expected to no longer focus on teaching material, but also the skills to use mathematics in everyday life. Because it is useless if the students get 100, but they have no ability. From the various results of PISA tests and evaluations, it showed that the performance of Indonesian students is indeed worrying, therefore the educators effort to improve the performance of Indonesian students is a challenge, teaching students to be able to count which is then used in daily life is the task of educators. This is also due to students being able to memorize counting questions such as one plus one and so on, but when faced with word problem experiment then they will be confused. To improve the quality of education in Indonesia so that they are not far behind in competitiveness from other countries, we s      hould do learning innovation which in fun learning especially in Maths.

Teaching formal Mathematics, the educators should begin by exploring the informal mathematical knowledge that students have gained from the society life around their homes. Things that are real and related to students' daily experiences can be used as an interesting learning resource. One aspect that can be developed for learning innovations is a local culture (Barton, 1996; D'Ambrosio, 2007). Countries that have different cultural diversity are Indonesia, including on the island of Sumatra, especially Jambi which has many cultural activities. Traditional games are one of the cultural activities that exist in the culture of Jambi society. Traditional games are not only games but also contain cultural values and practice skills in thinking and counting.

## 2. Method

The research was conducted on December 2018 to February 2019, which was generally carried out through three main steps, namely preliminary data analysis, data analysis during the research, and overall data analysis. This research uses descriptive qualitative research as a type of research to uncover and obtain information as a whole (Fitriani, S, et al. 2018; Prahmana, 2017). In this study, ethnographic methods were used. The data used in this study is written data that describes mathematical ideas that contained in traditional games. Data collection techniques were carried out by using observation, interviews, documentation, and field notes to obtain ethnographic descriptions (Fitriani, S, et al. 2018; Prahmana, 2017).

## 3. Result and Discussion

*3.1. Result*

According to (Dharmamulya, 2008) stated that traditional games contain cultural values such as the value of joy, the value of freedom, the value of democracy, togetherness, and honesty. Traditional games can also practice numeracy skills, and thinking and logic skills, and foster a sense of responsibility and socialization.

In the culture of the Jambi people, traditional games are still played by children in Jambi, but they begin to extinction. Traditional games contain mathematical concepts such as plane figure, kesebangunan, congruence, quadrangle and not less important traditional games also contain cultural values that can shape the character of children.

## 3.2. Discussion

### 3.2.1. Cultural Values and Geometry Concepts in Traditional Game Cingkling

Cingkling is one of the traditional games in the Jambi area. This game is played by children aged 6 to 12 years. This game can be played by several children, but is usually played by 2 to 5 children. Cingkling can be played on the home field. This traditional games have other benefits including increasing children's activeness, maintaining body balance because this game uses one leg when jumping, and accustoming children to socialize with friends regardless of social status. Cingkling games use equipment that must be prepared, covering the fields of Cingkling and Kuju. Kuju must be owned by every Cingkling player which usually in the form of broken tiles or stones in the form of plates. The game is started by doing lots of things to determine the main players and opposing players.

The rules or procedures for the traditional game Cingkling are:

1). The first step, the player draws the field of playing Cingkling. The field that the player depicts uses plane figure like circles, square, and rectangles. To draw, the players use broken bricks, tiles, chalk or scratches directly to the ground of the yard or field.

2) The second step, the player carries flat stones or broken tiles which are used as kuju to be casted on each plot in the flat plane of the game.

3) The third step, determines the main players who play first by drawing the jump and suit.

4) The fourth step, the player which selected as the main player, at first throws the kuju into the initial plot. If the kuju is thrown out of the line or out of the first plot, then the player is failed, then it is replaced by the second player. But if the first player succeeds in throwing the kuju right in one flat wake, the player must jump with one leg and the other leg bent backwards.

5) Stepping is done in stages from the first plot to the last plot in order provided that there are no missed plots to step on unless the existing map is Kuju player and Kuju opponent.

6) If when jumping the player's foot steps on the line, the player's hand touches the line and the opponent's goal, then the player is disqualified.

7) After reaching the last plot or peak of the Cingkling, the player jumps by placing both feet and taking the Kuju player himself to be brought back out of the Cingkling arena, with the qualification there is no opponent's Kuju in the last plot of Cingkling, if there is a Kuju opponent then players are not allowed to set foot on the last place but immediately brought Kuju out of the Cingkling arena by jumping one leg.

8) the player who was declared the winner was the fastest player that his/her Kuju had been thrown into all the plots from the beginning plot to the last plot and brought Kuju back outside the Cingkling arena.

In the Cingkling game, it uses the quadrilateral mathematical concept, Kuju which is owned by players is usually in the form of Plane Solid Figure.

### 3.2.2. Cultural Value and Concept of Social Arithmetic in Traditional Game Kembangan

Kembangan is a traditional game name found in the districts of Bungo Tebo, Sarolangun, and Bangko in the 1950s. This game is played on the occasion of Eid al-Fitr as a statement of gratitude to Allah SWT who has given mercy and blessings to humans. The game consists of 10 people aged 7 to 13 years. The tool used in the game Kembangan uses a number of leaves of wood that function as a means of payment in buying flowers later. Different leaf sizes interpret the price value. For small leaf sizes priced at Rp. 50, medium leaf size is priced at Rp. 100, the size of large leaves is priced at Rp. 1,000, and so on.

The rules or procedures for traditional game Kembangan are:

If the player is 10 people, it means one person acts as a flower seller, and one more person acts as a flower buyer, while eight other people act as flowers to be traded in this game. Each participant who acts as a flower must be named one by one at first. It is looked to C as a jasmine flower, D as a frangipani

flower, E as a kenanga flower, F as an orchid flower, G as a sun flower, H as a rose flower, I as a beautiful flower, and J as a cherry blossom.

Furthermore, money is prepared as a means of payment consisting of leaves of Rp. 50, Rp. 100, Rp. 500, Rp. 1000, and so on from the leaf sheet. To determine the role as a seller and the buyer, it is discussed first.

The first stage, all participants must enter the arena of the game field 20 x 20 meters. The player who act as sellers namely player A takes a sitting position in the middle of the field, while the other participants act as buyers standing in front of the seller, 8 players sit in a sash behind A with a distance of one and a half meters.

The second stage, player B approaches player A as the seller by bringing money in the form of leaves, and making payments while asking A with the dialog below:

B: Do you sell the orchid flower?

A: Yes

B: How much is the price?

A: Rp. 5,000, -

B: Can you give less than it?

A: Sorry brother, no more than that

B: If so, where are the items?

A: Those are, while pointing to the orchid flower behind him, participant F.

So, B makes a payment by using payment tool that consist of the wood leaves so that it is Rp. 5000, then seller A receives B payment. While player F who acts as an orchid flower runs around the circle once, immediately B chases him. This is where a player shows his agility, but if player F is more agile then F will be released from B. If in that chase B manages to catch F, then F must be entered into circle 1 and player F becomes rotten egg, but if player B did not succeed in capturing F, so F automatically enters into circle 2 which is named carp.

Punishment in this game for players who already defeat is a mental punishment because players who are in the carp circle will shout while clapping and doing little jumps up and down by saying "rotten eggs". In this game there is a social arithmetic concept when buying and selling transactions with payment instruments in the form of leaf sheets of different sizes, so that it can be classified as an educational game in Mathematics learning (Bambang Suwondo, 1983).

### 3.2.3. Cultural Values and the Concept of Solid Figure in Traditional Game Kotak Calok

This game is from Jambi city, the district of Batanghari, the district of Bungo, the district of Tebo, the district of Sarolangun, the district of Bangko, and the district of Tanjung Jabung. This game is usually played by Elementary school children to fill the spare time. The minimum game participants is 2 people and the maximum is 4 people. The tools used in the game are a piece of stick, lime, or pencil serves to noted by players when making a line or numbers at the time of the game is played (Bambang, S, 1983).

The following is sequence of the game:

In the first stage, participants suit, and who woin the suit will start the game first. Players win when suit the first time, making the plane solid figure as cube or cuboids, then it is continued to do the second to the second line so that made the cube or cuboids to complete the appropriate deal in the beginning of the game.

The second stage, suit is continued for the provision of numbers on each formed side, made until complete. The winner in this game is the one who can complete the good shape of cube or cuboids to the provision of figures each side.

Third stage, sanctions given to players who defeat is punishment based on the agreement.

In the game, it uses the concept of mathematical, the concept of plane solid figure which the cube and cuboids are began from making the line so that the provision of numbers on each side of the cube and cuboids. It gives understanding to the students the elements cube and cuboids.

### 3.2.4. Cultural Values and the Concept of Triangle and Measurement in the Traditional Game Fruit Cap

This fruit cap game is a game that use of marbles consisting of 3 marbles with first making the picture of isosceles Triangle or equilateral Triangle. This game is from Jambi city which is in Seberang Jambi City. This game is usually played from elementary school children until the mothers to fill the spare time in the evening and usually it is played under the stilt house. The minimum game participant is 2 people. This game teach players how to socializing with peers, encouraging to receive defeat or win, willing to accept the consequences for the actions taken and teaching to always take care and does not acted sloppy.

The steps as follows:

a. Game is begun by making isosceles triangle or equilateral triangle, fruit cap placed in the three corner triangles.

b. Players do hompimpah to determine the main players and the opponent players, players who win hompimpah considered as main player and others considered opponent players.

c. Main player holds a fruit cap with the agreed distance then fruit cap is thrown to the triangle with the aim hit the fruit cap which located in the three corner triangles. If it does not hit the fruit cap then followed by the second player to do the same. But if the throwing hit the fruit cap in one of the corner of the triangle, then the player can take fruit cap to hers and continue game for the fruit cap which contains in the other corner by measuring the distance using inch measurement.

In the game, it uses the concept of mathematical, the concept of triangle, which is begun in the making of the line so that it forms the isosceles triangle or equilateral then on each corner triangle placed fruit cap, it gives understanding to the students about the elements isosceles triangle or equilateral triangle. The other concept of Mathematics used is operating the number in the summation and reduction used in calculating. The number of fruit cap successfully owned by the players and calculate the rest of fruit cap if defeat in the game, calculate the profit and loss obtained in the fruit cap game.

### 3.2.5. Cultural Values and the Concept of Solid Figure in the Traditional Game Gasing Kayu (the Wood Top)

This game is a game that use tops that made from wood cone-shaped and use a piece of rope made from axis stove wound in the head tops. This game is usually played by elementary school children to youth to fill the spare time. The minimum game participant is 2 people, and usually played by boys. The following is the picture of Gasing Kayu.

There are the step as follows:

1. Each player who will play Gasing Kayu, should have Gasing Kayu and a piece of rope made from axis stove then wound it in to the top head.

2. This game is not started by doing hompimpah or suit to determine the major players, but players together threw each top so tops touch other top between players.

3. The top that play the longest, then declared the winner in this game.

The concept of Mathematics in this game is at the top resembling cone. In the manufacturing process of Gasing Kayu, the players have to know the basic concept of cone.

## 4. Conclusion
These results indicates that the traditional games in Jambi society need to be preserved by the community. This is because a lot of the values of the kindness of the game traditional, including the traditional game can train psychomotor aspect to make more active and creative. It also can be socialize with friends well, and improve the sense of solidarity and unity. In addition, the traditional game contains the concept of Mathematics and cultural values. The concept of Mathematics in the traditional games, such as solid figure, arithmetic social, measurement, and geometry. The traditional games can be used as a starting point or context in the learning design. So, it can change the paradigm of children and society that Math have a relationship with daily activities and Mathematics has a relationship with culture and can be studied with a fun way. It is in line with the Realistic Math Education Approach Philosophy that developed in the Netherlands and adopted in Indonesia in the Realistic Math Education Approach Philosophy (Freudenthal, 1991; gravemeijer, 1994; Hadi, 2017; sembiring, 2007; sembiring, at Inter alia, 2010; zulkardi, 2002. prahmana, 2018). Therefore, the results of this study take the role to add the study on context that can be used as a starting point in Mathematics learning which is the Jambi traditional games.

## 5. References

Barton, W. D. (1996). Ethnomathematics: Exploring Cultural Diversity in Mathematics Doctor of Philosophy in Mathematics Education. The University of Auckland

Freudenthal, H. (1973). Revisiting Mathematics Education. Dordrecht: Kluwer.

Gravemeijer, K. (1994). Developing Realistic Mathematics Education. Utrecht: Technipress, Culemborg.

Hadi, S. (2017). Pendidikan Matematika Realistik. Jakarta: Rajawali Pers.

Prahmana, R. C. I. (2017). Design Research (Teori dan Implementasinya: Suatu pengantar). Jakarta: Rajawali Pers.

Bambang Suwondo, Y., & Singgih Wibisono (1983). Permainan Anak-Anak Daerah Jambi. Jambi, Departemen Pendidikan dan Kebudayaan.

Fitriani, S., Somakim, S., & Hartono, Y. (2018). Eksplorasi Etnomatematika pada Budaya Masyarakat Jambi Kota Seberang. Journal Of Medives : Journal Of Mathematics Education IKIP Veteran Semarang, 2(2), 145-149.

Prahmana, R.C.I. (2010). Batu, Permen, dan Berbagi yang Adil. Majalah PMRI. 8 (3), 38-41.

Sembiring, R. K. (2007). PMRI: History, Progress, and Challenges. Jurnal Pendidikan Matematika, 1(1), 82-93.

Sembiring, R. K., Hoogland, K., & Dolk, M. (2010). A Decade of PMRI in Indonesia. Bandung, Utrecht: Ten Brink, Meppel.

Jaelani, A., Putri, R.I.I, & Hartono, Y. (2013).Students' Strategies of Measuring Time Using Traditional Gasing Game in Third Grade of Primary School. Journal on Mathematics Education, 4(1), 29-40.

Zulkardi. (2002). Developing a Learning Environment on Realistic Mathematics Education for Indonesian Student Teachers. Enschede: PrinPartners Ipkamp-Enschede.