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Planting Mathematics Concepts for Low Grade Elementary Schools through the Traditional Games

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Abstract: A common problem in mathematics education in Indonesia is the low interest in mathematics because students learning mathematics is learning to memorize formulas which they then formulate to solve problems. For elementary school students, this learning will be very boring and do not interact at all because they are far from those who still like to play. This paper will discuss the planting of math concepts for low-grade elementary schools through traditional games, according to local wisdom-based mathematics learning so that mathematics lessons are no longer a scourge for elementary students but become fun mathematics because children can learn mathematics from their games. Many studies have found that game strategies are effective in motivating children to learn mathematics and at the same time making the learning stop. The focus of this paper is on examples of traditional games that can support the learning process of mathematics and the role of the teacher in facilitating mathematics learning that isn't directly integrated into the game.

Keywords: CTL, Low Grade Elementary School, Traditional Games.

1. Introduction

A common problem in mathematics education in Indonesia is the low interest in mathematics which affects the low mathematics learning outcomes of students. Learning outcomes are not only aspects of the ability to understand mathematics as knowledge, but also attitudes towards mathematics. The background of this problem is the assumption of society which states that mathematics is a subject that is difficult to understand and understand. Most of the students felt that learning mathematics was learning to memorize formulas

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because at school all they got were the kinds of formulas that scientists had discovered earlier, so students only needed to memorize them, and then they were formulated to solve problems.

Mathematics is a subject that needs to be given to all students to equip students with the ability to think logically, analytically, systematically, critically, and creatively, as well as the ability to cooperate (Rusnilawati, et.al., 2020). One of the purpose of mathematics learning that has been established in the current curriculum in Indonesia is that students understand the concepts of mathematics, explain the interrelationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently and precisely, in problem solving, using reasoning on pillars and traits (E. B. Johnson, 2002).

The saturation felt by these students resulted in a lack of interest in their learning towards mathematics. Many mathematics studies only emphasize algorithms or procedures in solving problems at the formal level of mathematics. But in fact, students have problems understanding mathematical concepts at a formal level. Therefore, mathematics learning should not be started at the formal level but from the basics / concepts. In accordance with the mandate of the 2013 curriculum, the most appropriate learning method for instilling concepts in students is contextual learning.

Contextual learning can be said as a learning method that recognizes and shows the natural conditions of knowledge. Through relationships inside and outside the classroom, a context Planting Mathematics Concepts for Low Grade Elementary Schools use learning approach makes experiences more relevant and meaningful to students in building knowledge that they will apply in lifelong learning. Contextual Teaching and Learning (CTL) is an approach which helps students understand what they are learning by connecting their subject with their lives' context (M. Muslich, 2007). CTL approach emphasises students' interest and experiences, so the students are easy to understand the material (I. Satriani, and E. Emilia, 2012).

Contextual learning presents a concept that relates the subject that students learn with the context of the material, as well as the relationship to how someone learns or how students learn. Thus, in learning activities it is necessary to make efforts to make learning easier, simpler, meaningful and enjoyable so that students can easily accept ideas, ideas, easily understand problems and knowledge and can construct their own new knowledge actively, creatively and productively. Through this contextual approach students are expected to learn by experiencing by themselves not memorizing them. Additionally, some scholars found that Contextual Teaching and Learning (CTL) approach help students develop their achievement at school, also promote their critical and higher order thinking (S. Rahayu, 2015; Mardianto & E. L. Wijaya 2016; A. Nawas, 2017).

During the learning process, students are encouraged to find and develop strategies and ideas. The various strategies and ideas of students are directed at the formation and understanding of mathematical concepts as the ultimate goal of learning. Teaching mathematical concepts must be started from the beginning when children know mathematics so that children get a pleasant first impression on mathematics, so that in the future children do not think mathematics is an enemy to him. Therefore, learning number operation, especially multiplication at the primary level becomes one of the prerequisite knowledge, which must be owned by students, to step into the next topic of learning mathematics (R. C. I. Prahmana, Zulkardi, & Y. Hartono 2012).

The world of children is a world of play. Games are contextual problem situations for children so that games can be used as a starting point for the learning process in instilling mathematical concepts. In Indonesia, there are various kinds of traditional children's games containing mathematical concepts so that these traditional games can be used to planting mathematical concepts for low-grade elementary school students. Currently, folk games or traditional games are less popular for children, because they know modern games are better (N. K. A. Rahmadani, L. Latiana, & R. A. Aen, 2017). The traditional games have characteristics that could answer the character of elementary school children (Y. A. Nugraha, E. Handoyo, & S. Sulistyorini, 2018). Beside in mathematics, traditional games are good for health, help more children in their growth and development (S. Deona, 2020).

Traditional games teach children to be creative and socially interact that teaches the values of cooperation, sportsmanship, honesty and creativity (M. Zayyadi, S. I. Hasanah, & E. Surahmi, 2018). Various traditional games in early times such as patilan, bebentengan, pinci, congklak, kubuk, snake and ladders, jap-japan, goal-goalan, and monopoly.

The purpose of the study are to know the kinds of traditional games that can be planting Mathematics Concepts for Low Grade Elementary Schools. So how do you create a play situation to teach math concepts to

low-grade elementary school students and what games can support the inculcation of math concepts in low grade elementary school students?

2. Methodology

The type of this research is descriptive approach. Widodo, et.al, (2000) who said that research with descriptive method is a research method used to clarify social phenomena through various research variables that are interrelated with one another. She also added that in a descriptive study the researchers did not need to compile a hypothesis. Why? Because the research activities carried out for the process of testing and writing the results were only carried out after going directly to the field.

3. Results and Discussion

2.1. Characteristics of Contextual Learning

The contextual approach is a learning concept that emphasizes the relationship between learning material and the real world of student life, so that students are able to connect and apply competency learning outcomes in everyday life. Contextual learning is learning that motivates students to connect the knowledge they get from the learning process with their daily lives, which is useful for them to solve a problem in their environment so that he learning obtained by students is more meaningful. Muslich states, contextual learning has the following (M. Muslich, 2007):

Table 1. Characteristics of contextual learning.

No.	Characteristic
1	Carried out in an authentic context, namely learning that is directed at the achievement of skills in the context of real life or learning carried out in a natural environment (learning in real life)
2	Provides opportunities for students to do meaningful tasks (meaningful learning).
3	Carried out by providing meaningful experiences for students (learning by doing).
4	Carried out through group work, discussion, mutual correction between friends.
5	Provides opportunities to create a sense of community, work together, and deeply understand each other (learning to know each other deeply).
6	Carried out actively, creatively, productively, and emphasizes cooperation (learning to ask, to inquiry, to work together).
7	Carried out in a pleasant situation (learning as fun activity).

2.2. Game Based Learning

That is meaningful for students learning that is experienced directly by students. The knowledge gained from this direct experience will remain in the memory of students for a long time and will be remembered for all time. Especially if the experience is close to their world, namely the world of play, it will be more enjoyable and meaningful for students. Game-based learning can become a situation or contextual problem because games use more actions than explanations of material through words. These characteristics can stimulate students' motivation to learn. Therefore, games can support learning so that students become more active in their learning process. The collaboration formed in the game can train student collaboration and interaction.

Wijaya states that games can be an effective tool to improve learning and understanding of a learning topic (A. Wijaya, 2009). One example of this benefit is how Indonesian children's games (namely patilan and pinci) can support the learning process of length measurement. Although games have many benefits for the learning process, the use of games in the learning process cannot be carried out independently. The use of games in learning must be followed by a discussion activity to discuss and develop the values of the game into mathematical concepts. This is in line with the principles of experiential learning developed by Kolb (A. Wijaya, 2009). Kolb formulates four stages in experiential learning, namely: (1) real experience, (2) reflective observation, (3) abstract conceptualization, and (4) active experimentation.

In creating a game-based learning environment, the teacher must determine a strategy to get a fair game because the game will support the formation of natural situations for social interaction such as student

agreement in determining strategies to get fair play. The steps for game-based learning to include the activities are following.

Table 2. The steps for game-based learning.

Step	Activity
1	The teacher divides students into groups.
2	The group of students that was formed was a mixture in terms of their social background, gender, and learning ability.
3	The teacher explains the instructions and procedures for implementing the game.
4	Give students time to play the game in their groups while they learn on their own to find mathematical concepts that are contained in a game they play.
5	The teacher plays an important role in directing students' social interactions to achieve the goals of learning.
6	The teacher guides students so that they can express their ideas or ideas about the concepts they have got from the game.
7	Each group can convey their ideas to other students and other students can respond or argue with their friends' opinions.
8	After that the teacher concludes and explains the concepts they have got from the games.

2.3. Examples of Games for Learning Mathematics

The following games are examples of children's games that can be used for game-based mathematics learning:

2.3.1. Patilan is a children's game played in groups. There are 3 sessions in this game, first the short stick is thrown from behind the line by the playing group, then the distance the stick falls is measured. The second group throws short sticks and is hit with a long stick by the play group, then the distance the sticks fall from is measured again. And the third short stick was hit with a long stick by the playing group by means of a peg, then the distance the stick fell was measured by the short stick. The winner is the group that has accumulated the most points.

Figure 1. The Patilan games

The process of measuring stick distance contains the concept of measurement, in non-standard units. Naturally, players will use their limbs and objects around them, such as span, steps, or even the length of a stick to measure distance. The difference in the span used as a unit will give different measurement results. Here the teacher can use the term "fair play" to direct students to standard units. The teacher can use a fixed

measuring instrument so that the measurement can be fair. Measurement results that are not always whole numbers can also be used to introduce the concept of fractions.

2.3.2. Bebentengan is a child's game that is played individually. The game is almost the same as hide-and-seek. It's just that to determine the players' guards together throw the ball from behind the line. The player who throws the ball closest to him is guarding, the others can hide. Mathematical concepts contained in the game is comparison (when the difference in distance between the items is clear) or by measurement (when the difference in distance is not very clear).This contradiction is comparing distances directly when the difference between the spheres is quite clear or with measurements when the difference in ball distances is not so clear.

Figure 2. The Bebentengan games

2.3.3. Pinci/ Maarbles. The mathematical concept contained in the pinci game is when the player determines the order of the game. The player who can throw the pinci closest to the hole will play the earliest. Players can use two different strategies to determine the closest detail, namely by comparison (when the difference in distance between the items is clear) or by measurement (when the difference in distance is not very clear).

Figure 3. The Pinci/Marbles games

2.3.4. Congklak is a game played by two people. The tools used are made of wood or plastic. At both ends there is a hole called the parent. Between the two there is a hole smaller than the parent about 5 cm in

diameter. There are three versions of the game Congklak, namely Congklak with 1 hole, 12 holes and 16 holes (Z. Nuraeni, 2013).

- For Congklak 10 holes, 32 seeds will be used which will be distributed fairly in all small holes (i.e. 4 seeds for each small hole).
- For Congklak 12 holes, 50 seeds will be used which will be distributed fairly in all small holes (i.e. 5 seeds for each small hole).
- For Congklak 16 holes, 98 seeds will be used which will be distributed fairly in all small holes (i.e. 7 seeds for each small hole).

Figure 4. The Cogklak games

The way to play is to take the seeds that are in our side hole then fill the seeds one by one into the hole that is passed including our parent hole (left main hole) except the opponent's main hole, if the last seed falls in holes where there are other seeds, then the seeds are taken again to continue filling in the next holes. And so on until the last seed falls into an empty hole. If the last seed falls into an empty hole, it is the opposing player's turn to play the game. This game ends when the seeds in the small hole have been collected. The winner is the one who collects the most grain to his parent hole. This game is a means of managing strategy and accuracy. The principle of dividing seeds fairly for each small hole can be used to learn the concept of division, by slightly changing the rules about the number of seeds used. The concept of counting and addition is also included in the game Congklak, which is when determining the winner of the game.

2.3.5. Kubuk is a game played by several players using grain or gravel. The player who has a turn to play will guess the number of seeds shown by the guarding player by estimating the other numbers. For example in a game using 20 seeds stored in the right hand and left hand. The guard player will show the beans in the left hand for 3 seconds, and the other players will guess the number of seeds in the right hand. The mathematical concepts contained in this game are estimation and the concept of subtraction.

Figure 5. The Kubuk games

2.3.6. Snakes and ladders. In the snake and ladder game, the player has to roll the dice and then execute as many pieces as the number shown by the dice. When a pawn falls on a ladder, the player jumps up to the end of the ladder. But when a pawn falls on the snake's tail, the player has to slide down onto the box containing the snake's head. The winner is the player who reaches the winning box first. For example, for grade 1st Elementary School the winning box can be determined at 20 or 50.

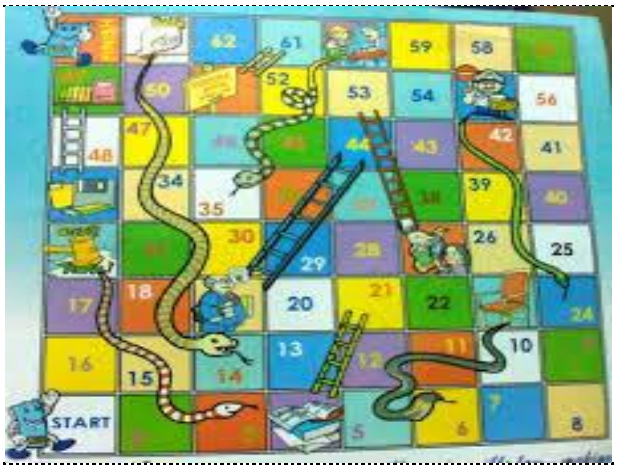

Figure 6. The Snake and Ladders games

The mathematical concept contained in the snake and ladder game is counting, addition and subtraction. The concept of counting will appear when the player moves the pawns one box at a time. The concept of addition will emerge when the player does not move the pieces per square, but instead immediately adds the dice numbers with the numbers in the previous position box and when players discuss how much profit they get when they get a ladder. The concept of subtraction can be emphasized when players are asked how much they lose when they encounter a snake.

2.3.7. Jap-japan. This game can be played by several players using a set of cards with numbers for example 1 – 40. Each player is dealt 2 cards and asked to add up the last digit of the number. What is taken is the unit only, if the sum exceeds 9 the unit will be taken, 10 is counted 0, 11 is counted as 1 and so on. The player who wins is the one who gets the total number of 9. However, the player can make a strategy by exchanging his cards with the opponent so that he can get the most sum. The mathematical concepts contained in this game are simple addition and the concept of place numbers.

Figure 7. The Jap-japan games with Cards

2.3.8. Goal-goalan. This game can be used to recognize numbers and teach the concept of jumping numbers to children. The game is carried out in groups, each group has a goal that must be guarded. Between the two hurdles are made boxes containing numbers. For example 1-10 or a sequence of multiples of numbers. The way to play is that each group representative jumps one box at a time while mentioning the number he trod on in opposite directions. One group will say the number forward, and the other group will count backwards. When two players meet in the same box, they will face each other (rock, scissors, paper). And the player who loses must step down and be replaced with another player, while the player who wins will continue his steps. The group that can reach the opponent's goal and the group wins. The position of the goal can be alternated so that everyone can feel counting forward and backward. The mathematical concept in this gol-golan game is the concept of counting forward and backward and can also be used for the concept of jumping numbers / multiples.

Figure 8. The Goal-goalan games

2.3.9. Monopoly. There are 2 types of monopoly, namely Indonesian monopoly and world monopoly. Monopoly game uses a square board around which there are boxes with the words cities in Indonesia / in the world. Players can build houses or hotels in a city, so that if a player stops at a box that has already been established a house / hotel, he will pay rent. In addition, there is also a box that says opportunity and mandatory funds. Players have the opportunity to get prizes and are also required to pay a fine, or bank interest. The mathematical concepts in this game are the concepts of money, addition and subtraction.

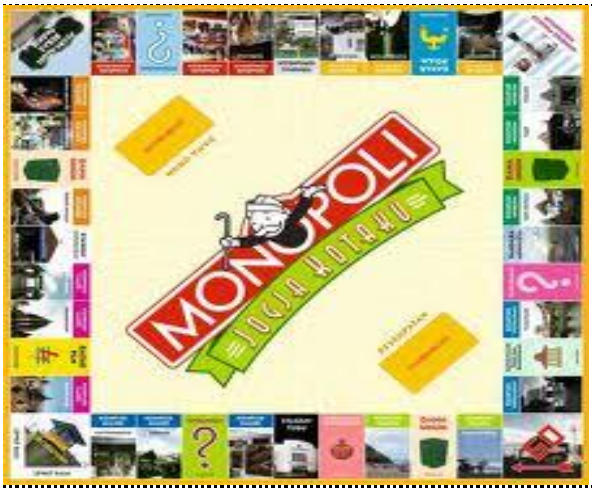

Figure 9. The Monopoly games

2.4. The Role of Teachers in Game-Based Learning

The traditional games can be played both formally at school and as children's daily games. Teachers or adults can invite children to play these games outside the classroom in a fun atmosphere so that students can get to know traditional games while learning mathematical concepts. Games support the formation of natural situations for social interaction such as student agreement in determining strategies to get a fair game (A. Wijaya, 2009). Games need to be supported by class discussions to develop students' real experiences into mathematical concepts. Therefore, the teacher has a very important role in directing students' social interactions to achieve learning goals. The teacher's role in directing class discussions can be described as follows:

Table 3. The teacher's role in directing class discussions.

Step	Activity
1	Give students the opportunity to come up with ideas.
2	Stimulate the formation of social interactions.
3	Linking activities.
4	Build the mathematical concepts contained in the game.
5	Ask students for clarification

4. Conclusion

The conclusion that we can get from this paper is that learning does not only occur in classrooms and in learning situations between students and teachers. Where teachers convey information and students pay attention to it. But learning can be done outside the room, even in the playroom, learning can also be done.

Children's games for realistic mathematics education based on local culture, especially ethno-mathematics, include patilan, bebentengan, pinci, kubuk, snakes and ladders, congklak, jap-japan, goal-goalan and monopoly. Traditional game-based learning like this will attract students' interest in learning mathematics and provide a strong understanding of the inculcation of mathematical concepts in lower grade elementary school students. Elementary school teachers in grade 1 or grade 2 can integrate this traditional game in planting basic mathematical concepts to students, so that students find their own concepts to be applied in formal mathematics education.

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