



# Building Mathematical Concepts Through Traditional Games to Develop Counting Skills for Early Childhood

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## ABSTRAK

Dalam beberapa tahun terakhir, metode pembelajaran yang menyenangkan hampir menghilang dari ruang kelas sekolah. Selain itu ada pengurangan waktu bermain yang aktif dan kreatif sehingga membuat siswa merasa bosan. Penelitian ini bertujuan untuk membangun (C5) konsep matematika sederhana dengan permainan tradisional Dakon dan Ular Tangga dalam mengembangkan kemampuan berhitung pada anak berkemampuan berpikir tingkat tinggi dan rendah. Jenis penelitian yang digunakan merupakan penelitian eksperimen semu (quasi experiment) dengan desain faktorial 2x2. Subjek dalam penelitian ini adalah anak kelompok B sebanyak 60 anak. Teknik pengumpulan data yang digunakan dalam penelitian ini adalah tes, dan observasi. Instrumen yang digunakan adalah soal tes, dan lembar observasi dengan menggunakan 5 indikator pengukuran kemampuan berhitung. Analisis data menggunakan uji Two Way ANOVA. Hasil dalam penelitian ini yaitu membangun konsep matematika sederhana dengan permainan tradisional dakon untuk mengembangkan kemampuan berhitung pada anak berkemampuan berpikir tingkat tinggi memberikan hasil yang lebih baik daripada permainan tradisional ular tangga dengan nilai Selisih Mean sebesar 1,533 dan nilai Signifikansi 0,0001. Membangun konsep matematika sederhana dengan permainan tradisional dakon untuk mengembangkan kemampuan berhitung pada anak berkemampuan berpikir tingkat rendah memberikan hasil yang lebih baik dibandingkan dengan permainan tradisional ular tangga dengan nilai Selisih Mean sebesar 2,867 dan nilai Signifikansi sebesar 0,0001. Dengan demikian dapat disimpulkan bahwa permainan tradisional Dakon sangat baik digunakan sebagai sarana untuk membangun konsep matematika sederhana khususnya kemampuan berhitung.

## ABSTRACT

In recent years, fun learning methods have almost disappeared from school classrooms. In addition, there is a reduction in active and creative playtime so that students feel bored. This study aims to build (C5) simple mathematical concepts with the traditional game Dakon and Snakes and Ladders in developing numeracy skills in children with high and low order thinking abilities. The type of research used is quasi-experimental research (quasi-experimental) with a 2x2 factorial design. The subjects in this study were 60 children in group B. The data collection techniques used in this study were tests and observations. The instrument used is a test question, and the observation sheet uses five indicators to measure the ability to count and analysis using Two Way ANOVA test. This research aims to build a simple mathematical concept with traditional dakon games to develop numeracy skills in children with higher-order thinking skills, which gives better results than the traditional snake and ladder game with a Mean Difference value of 1.533 and a Significance value of 0.0001. Building simple mathematical concepts with traditional dakon games to develop numeracy skills in children with low-level thinking abilities gave better results than the traditional snake and ladder game with a Mean Difference value of 2.867 and a Significance value of 0.0001. Thus, it can be concluded that the traditional dakon game is very well used to build simple mathematical concepts, especially numeracy skills.

## 1. INTRODUCTION

Along with the passage of a person's life, mathematics becomes one part of life that will never be separated. We need to realize how essential and influential mathematics is in human life (Bicer et al., 2021; Nurlaily et al., 2019; Pratama & Retnawati, 2018). From the results of surveys and research studies on the intelligence level of Indonesian children, the Program for International Student Assessment (PISA) exam system initiated by the Economic Co-operation and Development (OECD) explains the results of a survey conducted in 2015 where the Indonesian state's mathematics score was ranked 63rd. from 71 countries in the world (Nusantara et al., 2021; Umaroh & Pujiastuti, 2020). So it is essential to introduce simple mathematical concepts starting at an early age. It is expected to be a person's initial foundation for obtaining basic mathematical concepts and subsequent or more complex mathematical concepts (Hadiyanti et al.,

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2021; Kowiyah et al., 2019; Zandieh & Rasmussen, 2010). The importance of introducing early mathematical concepts to early childhood dramatically affects a person's mindset and ability to analyze and solve a problem in his future life (Kowiyah et al., 2019; Yaniawati et al., 2019). Of course, it makes mathematics the basis for forming one's logical way of thinking. The introduction of mathematics in children from an early age can stimulate their ability to think logically, analytically, systematically, critically, and creatively in the ability to work together (Putri & Suparno, 2020). The ability to think logically is also essential to support the development of learning science and mathematics. Therefore, one's ability to think logically must be formed from early childhood education.

Early childhood education, especially at the Kindergarten level, has programs to stimulate and develop children's potential in various aspects of development, such as cognitive, language, social, emotional, physical motor, religious, moral values, and art (Kandula et al., 2020; Kazu & İş, 2018; Yates & Twigg, 2017). Of the six aspects, cognitive is one of the essential aspects in early childhood development in the academic field (Peralbo-Uzquiano et al., 2020; Purpura & Schmitt, 2019). Cognitive development is closely related to logical-mathematical and naturalist intelligence. Stimulating logical-mathematical intelligence can improve cognitive development, especially logical thinking, basic concepts, information processing, and problem-solving (Nur et al., 2018; Wati & Wulansari, 2021). Simple mathematics is a part of cognitive development. Mathematics is an exact science that is the basis of other sciences so that Mathematics is interrelated with other sciences (Ambussaidi & Yang, 2019; Baya'a et al., 2019). It would be better if interactions and activities closely related to mathematics were challenging, engaging, and become a necessity that is forced or because of compulsion (Kowiyah & Mulyawati, 2018; Lin et al., 2020). In simple mathematics learning that is packaged in creative learning (playing) is a mathematics learning activity that is packaged through creative, stimulant activities and directly experienced by children (Hands-on Experiences) who can give positive feelings towards mathematics in the long term (Mirawati, 2017; Nurhayati & Rasyid, 2019).

In fact, in Indonesia, the learning process for kindergarten children is still a problem in recent years (Aisyah et al., 2019; Risnawati & Nuraeni, 2019). It is because learning patterns tend to be academically oriented and assume that the concepts that exist in children do not develop spontaneously but must be instilled and absorbed by children through adult treatment, where the teacher is the subject, and the child is the object of the learning process (Budianti, 2021; Jatmikowati et al., 2015). Currently, there are many elementary schools, exceptionally excellent elementary schools that use reading, writing, and counting ability as a test for screening new students entering elementary school (Asiah, 2018). It encourages educational institutions providing PAUD and parents to teach reading, writing actively, and counting abilities using learning in elementary schools that are not by the child's developmental stages (Asiah, 2018; Nurwahidah et al., 2021; Rekysika & Haryanto, 2019). In recent years, fun learning methods have almost disappeared from school classrooms, and there is a reduction in active, creative playtime, both at home and outside the home. An educator needs to play a learning method to develop children's abilities, especially science and mathematics. Learning with the play method will encourage children so that they bring out and improve specific creativity, especially science and math skills (Manurung, 2021; Pitaloka et al., 2021).

In the learning process in early childhood, it should be carried out to provide basic concepts that have meaning for children, which can be done through playing or providing real experiences that will allow children to show activity and curiosity optimally (Nurani & Mayangasri, 2017; Nurwahidah et al., 2021). It is because meaningful learning for early childhood is learning while playing. Play activities are the needs of early childhood that must be met. The game is a tool for children to channel their energy, satisfy their passions and fantasies, and intellectuals (Azis, 2019; Holis, 2016; Rahmatia et al., 2021). The world of children is playing, and children understand the world through the process of playing. Early childhood has characteristics that still like playing activities as the central part of learning (Suryaningsih & Rimpiati, 2018; Trisniawati et al., 2018). Playing for children can provide joy and make the learning process more developed (Dwiyananti et al., 2018; Nurwahidah et al., 2021). The teaching and learning process for early childhood also emphasizes the principle of learning while playing and playing while learning. Such learning makes children's cognitive abilities emerge and develop through playing activities using game tools that contain educational elements or values (Aisyah et al., 2019; Dwiyananti et al., 2018; Muloke et al., 2017). The game itself is divided into two, namely Traditional Games and Modern Games.

Traditional games are games inherited by ancestors and need to be preserved because they contain local wisdom values, "good," "positive," "worth," and "desired" values. Traditional games for children in every region and community are shaped by local culture and environment (Puspitasari et al., 2021; Zayyadi et al., 2018). Each traditional game has its level of difficulty, so it is necessary to pay attention to the implementation of the game at its age stage, especially for early childhood. Parents and education practitioners must also understand that traditional games have many benefits for various aspects of children's development. Not only in the physical aspects of motor, but also in other aspects. One of these

aspects is cognitive, especially in the introduction of simple mathematics, namely the ability to count. One of the traditional games suitable for early childhood in group B Kindergarten, especially in early arithmetic skills, is Congklak (Dakon) and Snakes and Ladders. The Dakon/Congklak game is a traditional board game that was quite popular in ancient times. Dakon can be played at leisure on the house's terrace or under a tree (Muslihatun et al., 2019; Susilawati et al., 2021). The learning and playing activities using congklak media are exciting and fun. By playing, children find new things, practice skills, and interest in learning mathematical concepts (Muslihatun et al., 2019; Putra & Hasanah, 2018). At the same time, the Snake and Ladders game is a traditional game with a concept. Two or more children play this game by throwing dice consisting of several boxes with pictures (Afandi, 2015; Nawafilah & Masruroh, 2020). A traditional game based on physical activity is essential to develop children's muscles. Since traditional games usually utilize handmade equipment, they can develop children's brain creativity (Eskasasnanda, 2017; Nugraha et al., 2018).

*Modern games* are games that are carried out using technological tools that have developed in the community and can be played by approximately two people and can even be done alone without a playmate so that with the development of the times and technology, the growth of children is growing so that the value of the child's character is getting lost (Novrialdy, 2019; Syafryadin et al., 2021). The results of field observations show that children, especially at an early age, are more fond of modern games than traditional games. However, it should be noted that traditional games have many benefits, especially in improving developmental aspects. Many parents find that quality games are the types of games made of expensive materials, and parents will feel proud if they can buy their children's games from abroad or imported toys (Lestarinigrum, 2018; Munawaroh, 2017). Other than that, children are now more fond of modern games using gadgets, with various applications and games easily accessible to children through their gadgets (Rizal et al., 2020; Suryanda et al., 2019; Synnott, 2018). Not many parents are aware that gadgets negatively impact early childhood, but it is undeniable that wise use of gadgets also has a positive impact along with awareness and progress in an all-digital era (Rohayani, 2020; Widiyono, 2020). Some of the negative impacts when children are now happier with games using gadgets, including children being indifferent to the environment or people around them; Then all sensory and motor activity that children usually get when playing also decreases, and the brain, eyes, and fingers work more. In addition, the ability to recognize children's simple concepts is no longer obtained through experience. However, it is obtained from content presentations on devices and happiness. Those children used to get when playing with friends is now changing with the feelings of children being made pounding, with the ambition always to win and angry/depressed when losing while playing. Therefore, our research aims to build simple mathematical concepts with the traditional game of Dakon and Snakes and Ladders to develop numeracy skills in children with higher-order thinking abilities and lower-order thinking abilities.

## 2. METHOD

This study uses experimental research methods with research variables including two independent variables, namely the method of playing with traditional games (Snakes and Ladders, and Dakon) and simple mathematical concepts (high level and low level), and one dependent variable, namely the ability to count, with the following indicators: 1) Children are able to name numbers 1-20; 2) the child is able to count numbers; 3) the child is able to add numbers correctly; 4) the child is able to reduce numbers correctly; 5) children are able to solve problems. The experimental design used is a 2x2 factorial design. In this design, there are two groups, each of which is randomly selected. The first group is the experimental group who learns through the method of playing with the traditional game of snakes and ladders. The second group is the experimental group who learns through the method of playing with traditional dakon games.

Sampling in this study was carried out by the method of stratified random sampling (Stratified Random Sampling). This is because this study takes samples based on a certain level, namely children who have high and low levels of simple mathematical concepts so that the sample used is group B kindergarten students from 3 schools in Kediri City as many as 60 children. The data collection technique used in this research is a matter of test (pretest and posttest), and observation. Test questions and observations were used to determine the child's numeracy skills using the traditional game method Snakes and Ladders and Dakon. The instruments used are test questions and observation sheets that have been consulted with experts and experienced kindergarten teachers. The ability to count in children is divided into 2, namely high thinking ability and low thinking ability by using the following formula. The grid instrument used in this study is presented in table 1.

**Table 1.** Research Instrument Grid

No.	Indicator	Number
1	Mention the numbers 1-20	1, 2
2	Counting numbers	3, 4
3	Add up numbers	5, 6
4	Reduce numbers	7, 8
5	Solve problems	9, 10

Data analysis was conducted to find out and test the truth of the proposed hypothesis. This research is a quasi-experimental research with a 2x2 factorial design. Thus, the data analysis used the Two Way ANOVA test. This analysis is appropriate to compare the effects of giving different treatments, whether there are significant differences or not. In general, the primary analysis in factorial experimental designs is to compare the interaction effects between factors. If there is a difference in the interaction effect, then a simple effect analysis is carried out, and if there is no difference in the interaction effect, the primary effect analysis is carried out. For the hypothesis test to be carried out, the analysis prerequisite test must first be carried out, including the normality test and homogeneity test. The normality test is intended to determine whether the samples taken in this study come from a population that is normally distributed or not. The Kolmogorov-Smirnov test was carried out for the normality test, while the data homogeneity test was used for the Levene test.

### 3. RESULT AND DISCUSSION

#### Result

The children play dakon starting with a high five (determining who plays first) then the winning child takes the *kecik* and is placed one by one in the dakon hole. Through traditional dakon games, children can develop their numeracy skills. This is because, the concept of the Dakon game uses the concept of addition and subtraction when filling items one by one into the hole that is passed including our own master plan hole (left) except for the opponent's master plan hole. Other than that, traditional Dakon games also train fine motor manipulation skills, train concentration, educate children's sportsmanship, and also practice strategy skills (Zayyadi et al., 2018; Zayyadi & Subaidi, 2017).

**Picture 1.** Traditional Games Dakon

The children started playing snakes and ladders with a high five (determining who played first). Then the child chooses the person to run (red/blue/yellow). After that the child shakes the dice and runs according to the number of dots on the dice. The game of snakes and ladders can improve the ability to count in children because in this game the child is assigned to count each step taken. This game also develops related mathematical abilities with communication, problem solving, understanding, and creative thinking (Atmoko et al., 2017; Nawafilah & Masrurroh, 2020; Sibuea & Sinaga, 2018).



**Picture 2.** Traditional Games Snake and Ladders

Prior to the Two Way ANOVA test, assumptions were first tested which included normality and homogeneity tests with a sample of 60 children. The normality test is used to see whether the sample used in this study comes from a population that is normally distributed or not, while the homogeneity test is used to see whether the sample has the same variance or can be said to be homogeneous data. The results of the normality and homogeneity test with the help of the SPSS program show that the sig value for the normality test is 0.204 and the sig value for the homogeneity test is 0.803. Based on the test result, it can be said that the samples taken in this study were normal and homogeneous. After the assumption test can be met, interaction analysis can be carried out. This analysis is used to see whether the interaction between traditional games and simple mathematical concepts has the same effect on early childhood numeracy skills. By using the F test for the interaction of traditional games and simple mathematical concepts, the value is 7.507 with a Sig value of 0.008. Because the value of Sig is smaller than the predetermined alpha of 0.05, the decision taken is to reject  $H_0$ . So it can be concluded that there is an interaction between traditional games and thinking ability (TA). In other words, it can also be said that not all interactions between traditional games and simple mathematical concepts have the same effect on early childhood numeracy skills. Because there are interaction factors, the next analysis is simple effect analysis. This analysis is to answer more clearly "What types of traditional games are suitable for each level of thinking ability (TA); and conversely, what level of thinking ability (TA) is most suitable for each traditional game".

This analysis aims to answer the level of knowledge of what simple mathematical concepts are most appropriate for the traditional game of dakon and snakes and ladders. The test result shows the Sig value of 0.0001. Because the value of Sig is smaller than the predetermined alpha of 0.05, it can be concluded that the difference in the level of thinking ability with the traditional game of dakon and snakes and ladders gives different results. Furthermore, further tests were carried out to determine whether there was a significant difference between high and low levels of thinking ability. The building simple mathematical concepts with the traditional game of Dakon and Snakes and Ladders to develop numeracy skills in high thinking ability children better than low thinking ability children. So that means the application of traditional games, both Dakon (Game 1) and Snakes and Ladders (Game 2) is very appropriate to be given to children with high thinking ability. However, if it is seen from the results of the average difference, the traditional Dakon game (Game 1) is more appropriate to be given to children with knowledge of simple mathematical concepts at both high and low levels than the traditional Snake and Ladders game (Game 2).

This analysis aims to answer what types of traditional games are most appropriate for high-level and low-level simple math concepts. The test result shows the Sig value of 0.0001. Because the Sig value is smaller than the predetermined alpha of 0.05, it can be concluded that the different types of traditional games with high-level and low-level simple mathematical concepts give different results. Furthermore, further tests were carried out to determine the significant difference between the types of traditional games of Dakon and Anakes and Ladders. The building simple mathematical concepts with traditional Dakon games to develop numeracy skills in high and low thinking ability children is better than using the traditional Snakes and Ladders game. So that means the application of traditional games Dakon (Game 1) is very appropriate to be given to children with high thinking ability and low thinking ability.

## Discussion

This study provides information that the method of playing through the traditional game of Dakon and Snakes and Ladders has a different effect on early childhood numeracy skills. The results of this study support previous research that traditional games can improve students' academic abilities by adjusting to

their respective cultures and countries. The game congklak can be an alternative for teachers in increasing students' memory performance capacity, traditional games in Bengkulu, for example, the game "many people"; 'pack bananas'; "Sesimbunan," can provide benefits in stimulating children's growth and development (Iswinarti & Suminar, 2019; Puspitasari et al., 2021).

Traditional games in this study have an impact on the level of knowledge of simple mathematical concepts. Children with a high level of knowledge of simple mathematical concepts have better numeracy skills when given the traditional game of Dakon than Snakes and Ladders. In contrast, for children with a low level of simple mathematical concepts, their numeracy skills will also be better if given the traditional game of Dakon than Snakes and Ladders. This traditional game is closely related to children's psychological abilities, especially cognitive development, and at the same time, can increase children's creativity (Damanik & Sinaga, 2021; Pic et al., 2019). The research results are relevant that the dakon game as a traditional game is very effective in learning to count in introducing simple mathematical concepts. Several previous studies also support that the use of dakon games can facilitate understanding mathematical concepts (Asrial et al., 2020; Laily et al., 2019; Mulyani et al., 2020). In line with this, traditional games can improve problem-solving skills in children, stimulate language development, verbal skills, social skills, a good place for emotional expression for children, and increase children's learning motivation (Lestari & Prima, 2017; Nataliya, 2015; Zayyadi et al., 2018). Children can rediscover the concept of adding numbers from their experience in playing the traditional game of dakon. The stages in a child's learning trajectory have an essential role in understanding the concept of number operations from the informal to the formal level (Nursyahidah et al., 2013; Prahmana et al., 2012).

Simple mathematical concepts with dakon games are efficient for students who have low-level thinking skills. It is evident in the study results where the dakon game has a reasonably high mean difference compared to the application of the snake and ladder game. The thing that becomes an obstacle in the snake and ladder game is that in the implementation of the snake and ladder game, it is only applied to specific materials, and students pay less attention to the rules of the snake and ladder game. These constraints can affect the increase in cognitive development in physiological maturity, experiences of children who have been through since childhood, and mental skills. However, on the other hand, based on the results of research that has been done, the use of the snake and ladder concept can improve the cognitive development of children who have learning difficulties. Research respondents showed that the concept of counting could be built well through the game of snakes and ladders. It can be seen when each player can reach the last stage in the game of snakes and ladders. At a glance, the snake and ladder game is a board game for children played by two or more people (Ibam, et al, 2018). Which consists of several elements, including game boards, dice, pawns, cards containing questions, bonus cards, surprise questions. and zonk cards (Ibam et al., 2018; Meriyati et al., 2019; Srinivasan, 2019).

The implication in learning with the application of games is that educators must be creative in using strategies and presenting learning media to catch the subject matter presented by the teacher quickly. Educators who will teach mathematics to early childhood should not be too textual, theoretical, and rigid during the learning process. Learning activities must be packed with play activities and be meaningful for children. Learning in early childhood education should use a quality preschool approach that can "invite children to experience mathematics as they play, describe and think about their world. Based on extensive research and training, teachers in early childhood education should plan activities that simultaneously involve cognitive, socio-emotional, and physical development and build on children's informal knowledge and experiences (Agusti et al., 2018; Hasibuan & Jannah, 2018). Through creative games, children have more opportunities to enrich their movements. Various movements with motor-sensory, hands, feet, head, or another part of the body involving both big and small muscle will enable them to develop their physical motor ability fully. Play-based learning is currently getting more support, wherewith games, there are many valuable things that children get, namely strengthening many areas of development so that it must include games that can hone children's independence and get a grip. In the experience of playing, that still gets adult direction. In this case, the teacher's playfulness seems to predispose to specific creative actions, including those required in scientific and mathematical files.

#### 4. CONCLUSION

The conclusion obtained from this study is that building simple mathematical concepts through traditional dakon games to develop numeracy skills in children with high and low-level thinking skills provides better and more effective results than the traditional snake and ladder game.

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