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IMPROVING NUMBER CONCEPT RECOGNITION IN 4-5 YEAR OLD CHILDREN THROUGH THE EDUCATIONAL GAME OF CONGKLAK AT RA AL-MADINAH JAKARTA

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Abstract

This study aimed to examine the effect of using *congklak* on the ability to understand number concepts among children aged 4–5 years at RA Al-Madinah Jakarta. The research employed an experimental method with a one-group pretest-posttest design. A total of 13 children were selected using purposive sampling based on age and cognitive readiness criteria. The research instrument was a number concept ability test covering four aspects: counting objects, rote counting, associating numbers with quantities, and comparing quantities. Data analysis involved normality and linearity tests, followed by a simple linear regression analysis. The results indicated that the data were normally distributed and the relationship between variables was linear. The regression test showed a significance value (p) = 0.006 < 0.05, indicating a significant effect of the *congklak* game on children's number concept understanding. The coefficient of determination (R^2) was 0.515, meaning that 51.5% of the variation in the dependent variable was explained by the independent variable. These findings demonstrate that *congklak* is an effective learning medium that supports the enhancement of children's number concept skills in a joyful and meaningful way. Therefore, traditional games such as *congklak* deserve to be considered as alternative instructional media in early childhood mathematics education.

Keywords: Number concept; Educational Game; Congklak.

Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh penggunaan permainan congklak terhadap kemampuan mengenal konsep bilangan anak usia 4–5 tahun di RA Al-Madinah Jakarta. Penelitian ini menggunakan metode eksperimen dengan desain one group pretest-posttest. Subjek penelitian berjumlah 13 anak yang dipilih melalui teknik purposive sampling berdasarkan kriteria usia dan kesiapan kognitif. Instrumen penelitian berupa tes kemampuan konsep bilangan yang mencakup empat aspek, yaitu menghitung, membilang, menghubungkan angka dengan jumlah benda, dan membandingkan kuantitas. Data dianalisis menggunakan uji prasyarat normalitas dan linearitas, kemudian dilanjutkan dengan uji regresi linear sederhana. Hasil analisis menunjukkan bahwa data berdistribusi normal dan hubungan antar variabel bersifat linear. Uji regresi menunjukkan nilai signifikansi (p) = 0.006 < 0.05, yang berarti terdapat pengaruh signifikan antara permainan congklak terhadap kemampuan mengenal konsep bilangan anak. Nilai R^2 sebesar 0.515 menunjukkan bahwa kontribusi variabel bebas terhadap variabel terikat adalah sebesar 51.5%. Temuan ini membuktikan bahwa permainan congklak efektif sebagai media pembelajaran yang mendukung peningkatan kemampuan bilangan anak secara menyenangkan. Oleh karena itu, permainan tradisional seperti congklak layak dijadikan alternatif media pembelajaran dalam pembelajaran matematika di pendidikan anak usia dini.

***Kata kunci**: konsep bilangan; alat permainan edukatif; congklak.*

Introduction

According to (Pesona & Vol, n.d.), the concept of numbers refers to a set of objects or numerical symbols that provide a sense of meaning and understanding. It can thus be concluded that the introduction of number concepts in early childhood is essential because it forms the foundation for mastering subsequent mathematical concepts. When children understand numerical concepts from an early age, they become capable of solving problems and constructing their own mathematical knowledge, which they encounter in daily life situations. Similarly, Shamsudin (2002) in (Yuliandari & Mahyuddin, 2020) defines numbers as the quantity or total of a certain set of objects. Numbers represent a mathematical concept that is vital to understand because it acts as the key to mastering further educational concepts. Marhijanto also argues that the concept of numbers includes all forms of numbers expressed in symbolic or numerical form, which are inherently abstract. This abstraction refers to how numbers function as representations of quantity and order. Busthomi (2012) in (Yuliandari & Mahyuddin, 2020) further explains that number concepts in early mathematics involve counting numbers, establishing one-to-one correspondence, comparing quantities, and recognizing symbols associated with specific quantities of objects. These fundamental abilities serve as the building blocks for higher mathematical thinking.

Referring to Montessori's interpretation of Blaise Pascal's observation, Kusumo (2017) in (Yuliandari & Mahyuddin, 2020) states that children are naturally born with a "mathematical mind." As children grow and develop, they become curious about the numerical elements embedded in everyday language and experiences. This natural curiosity highlights the importance of nurturing mathematical understanding through engaging and meaningful activities from the earliest years. The Montessori approach, which emphasizes learning through concrete experiences and sensory exploration, aligns well with the developmental needs of young children in understanding abstract mathematical ideas, particularly the concept of numbers.

Early childhood is often described as a highly strategic period in shaping children's basic character, personality, and cognitive skills. During this stage, development occurs rapidly and continuously across various domains, which is why it is often referred to as the "golden age." At this time, children are exceptionally receptive to information from their environment, making it a critical period for introducing foundational concepts, including mathematics (Widodo, 2019). Early Childhood Education (ECE) therefore plays a vital role in fostering holistic development—physically, mentally, socially, and spiritually—through stimulation that matches children's developmental stages. According to the Ministry of Education and Culture (2014), the purpose of ECE is to optimize children's development across multiple dimensions, including moral and religious values, social-emotional growth, cognitive development, physical-motor

coordination, language skills, and artistic expression. Consequently, educators and parents must collaborate to create a supportive, enjoyable, and meaningful learning environment that promotes well-rounded child development.

Among the various aspects of development, the cognitive domain deserves special emphasis in early childhood education because it directly influences how children understand, process, and use information in everyday contexts. Mansur, as cited in Mulyani (2018), describes cognitive development as a process through which individuals actively increase their knowledge by engaging in meaningful and repetitive learning experiences. In modern educational settings, early childhood learning increasingly demands innovative and enjoyable strategies that allow children to grasp abstract concepts, such as numbers, in concrete and stimulating ways. Research conducted by (Ilmiah & Pendidikan, 2022) demonstrated that the use of simple media—such as paper plates—can effectively enhance both literacy and cognitive skills through play-based learning. This finding underscores the value of incorporating everyday materials into the learning process to make abstract concepts more tangible for children.

In this context, introducing the concept of numbers is a crucial part of early cognitive stimulation. It provides the groundwork for more complex mathematical learning in later education. As Busthomi in Roliana (2018) explains, number concepts encompass skills such as counting, one-to-one correspondence, comparing quantities, and recognizing number symbols—all of which must be practiced through concrete, contextual, and developmentally appropriate activities. Without such foundational experiences, children may find it difficult to understand or apply mathematical concepts as they progress in school.

However, despite its importance, the reality in many early childhood learning environments remains less than ideal. Based on initial observations at RA Al-Madinah in January 2025, the process of teaching number concepts to children was found to be suboptimal and still heavily teacher-centered. Teachers predominantly relied on conventional methods, such as lecturing and providing written exercises through Children's Worksheets (Lembar Kerja Anak or LKA). This approach limited opportunities for children to engage actively—both physically and mentally—in the learning process. As a result, many children appeared easily bored, less motivated, and deprived of meaningful, hands-on experiences that could deepen their understanding of numbers.

Moreover, it was observed that most children could merely memorize the sequence of numbers from 1 to 10 without truly grasping their meaning or function. When asked to identify or match numbers randomly, many were unable to do so correctly. This indicates a superficial understanding, focused more on rote memorization than conceptual comprehension. According to the Standard Level of Child Development Achievement (STTPA), children aged 4–5 years should ideally be able to name number symbols 1–10, count using concrete objects, and match

number symbols with the correct quantity of items. These competencies are fundamental indicators of early numeracy development. Therefore, there is a pressing need for more innovative, engaging, and child-centered learning approaches that allow children to learn through exploration, interaction, and play.

To address these challenges, numerous studies have demonstrated the effectiveness of traditional educational play tools (Alat Permainan Edukatif, APE)—such as congklak—in enhancing early childhood cognitive development and numeracy skills. Congklak, a traditional Indonesian counting game, inherently integrates elements of counting, decision-making, and number matching. Its gameplay involves moving and counting seeds or pebbles, making it a naturally mathematical and strategic activity. Furthermore, congklak can easily be made using environmentally friendly materials such as cardboard, recycled bottles, or plastic beads, aligning with the principles of sustainable, environmentally based learning.

According to (Syafrida, 2014), the excessive use of digital devices, particularly smartphones, can hinder the development of children's social and cognitive skills. In contrast, stimulating interactions through tangible and traditional media, such as number boards or congklak, can enhance self-regulation, concentration, and communication skills. Such games also cultivate cooperation, patience, and problem-solving abilities—skills that are equally valuable for holistic child development.

In addition to helping children grasp the concept of numbers in a concrete manner, using congklak as an educational tool provides an enjoyable and interactive play experience that naturally encourages active participation. Through this game, children are not merely passive recipients of information but active learners who engage their senses, thinking skills, and emotions simultaneously. This play-based approach aligns perfectly with the constructivist view of learning, which posits that children build knowledge through active exploration and interaction with their environment.

Previous research by (Budiani et al., 2019), (Akhida, 2014), and (Kurniasih, 2020) supports this claim, showing that the congklak game significantly improves children's ability to count, enhances their mathematical logic, and strengthens cognitive reasoning skills. These studies highlight the potential of traditional games as effective learning media that blend cultural heritage with pedagogical value. By integrating congklak into the classroom, teachers can transform mathematics from an abstract and intimidating subject into an enjoyable and meaningful learning experience for children.

Based on this background, the present study aims to explore and analyze the effect of the congklak educational game tool on children's ability to recognize number concepts, particularly among children aged 4–5 years at RA Al-Madinah. This research seeks to offer an alternative learning medium that is not only effective

and developmentally appropriate but also promotes environmental awareness and cultural appreciation. Through this initiative, it is expected that children will gain a deeper, more concrete understanding of numbers while developing broader cognitive and social competencies. Ultimately, this study aspires to contribute to the development of early childhood education practices that are more interactive, sustainable, and culturally relevant in fostering children's numeracy skills and holistic growth.

Method

This type of research is quantitative research with an experimental approach. Experimental research is conducted to observe an object systematically with the aim of obtaining valid data and can be used to improve the quality of education. This research is used to determine the effect of environment-based educational game tools (APE) on the ability of number concepts of children aged 4-5 years at RA Al-Madinah. In this study there are two variables, namely the independent variable and the dependent variable. The independent variable is APE congklak (X), while the dependent variable is the ability to recognize children's number concepts (Y).

The design used in this study was a one-group pretest-posttest design, where the research subjects were given an initial test (pretest), then given treatment, and finally measured again with a posttest. According to Gay (1981), experimental research is the most appropriate approach in testing hypotheses scientifically. Wiersma (1991) also mentioned that experimentation is a form of research in which at least one independent variable is manipulated as treatment or intervention. Arikunto (2009) states that the one-group pretest-posttest design can provide an overview of the effectiveness of a treatment applied in the learning process. This design allows researchers to assess changes that occur before and after treatment is given.

The population in this study were all RA Al-Madinah children totaling 92 children. The sample used in this study was group A1 children consisting of 13 children, who were selected through purposive sampling technique. The sample selection was based on certain criteria, namely children aged 4-5 years and have not had creative play experiences in recognizing number concepts. Data collection was carried out through three main stages, namely pretest, treatment, and posttest.

The treatment in the form of using APE congklak was carried out through the stages of opening, core activities, and closing which were designed to be fun and interactive.

The instrument used in this research is a test of the ability to recognize early childhood number concepts, which includes four aspects, namely counting, counting, connecting, and comparing. Assessment scores were categorized from "Undeveloped" to "Very Well Developed." The validity of the instrument was tested using Pearson correlation, while the reliability was tested using Cronbach's Alpha

method and resulted in a value of α = 0.965, indicating that the instrument was highly reliable. Data analysis techniques included normality test (pretest = 0.194 > 0.05, posttest = 0.087 > 0.05) and linearity test (sig = 0.810 > 0.05), which showed the data met the statistical assumptions. Simple linear regression test shows that there is a significant effect of using APE congklak on the ability to recognize children's number concepts, with a significance value of p = 0.006 < 0.05.

Results and Discussion

This study aimed to examine the effect of using the traditional congklak game on improving the ability to recognize number concepts among children aged 4–5 years at RA Al-Madinah Jakarta. The research employed an experimental approach with a *one-group pretest–posttest* design involving 13 children selected based on age and cognitive readiness. The research process consisted of three main stages—pretest, treatment, and posttest—to assess the improvement in children's numeracy skills after being exposed to the congklak learning medium. Data were analyzed using normality, linearity, and simple linear regression tests to determine the extent to which the congklak game influenced children's number concept abilities.

1. *Overview of Research Data Results*

Before the intervention, a pretest was administered to measure the children's baseline ability to recognize number concepts. The test encompassed four key aspects: counting concrete objects, rote counting, associating numbers with quantities, and comparing quantities. The pretest results revealed that the children's abilities were still relatively low. The highest score achieved was 21 and the lowest 15, with an average score of 17.08. These findings indicate that most children were only capable of reciting numbers sequentially from one to ten without comprehending their quantitative meaning. Their understanding of numbers was still limited to memorization rather than conceptual knowledge; they were unable to associate number symbols with actual quantities or determine which group of objects contained more or fewer items.

Following ten sessions of treatment using the congklak educational game, a posttest was administered to measure progress. The posttest results demonstrated a substantial improvement in children's abilities. The highest score increased to 45, the lowest score rose to 41, and the average score improved significantly to 42.46. The median and mode both reached 43, reflecting consistency across participants. The variance decreased from 2.74 in the pretest to 1.60 in the posttest, while the standard deviation dropped from 1.66 to 1.27, indicating that children's performances became more homogeneous. In other words, the congklak intervention not only improved individual achievement but also contributed to a more uniform level of numeracy understanding among the participants.

Normality testing using the Shapiro–Wilk method yielded p-values of 0.194 for the pretest and 0.087 for the posttest, both greater than 0.05, confirming that the

data were normally distributed. The linearity test produced a significance value of 0.810 > 0.05, suggesting that the relationship between the independent variable (the congklak game) and the dependent variable (number concept ability) was linear. The simple linear regression test further showed a significance value of p = 0.006 < 0.05 with a coefficient of determination (R^2) of 0.515, meaning that 51.5% of the improvement in children's number concept ability was attributable to the use of the congklak educational game, while the remaining 48.5% was influenced by other factors, such as parental support, prior play experience, or individual differences in cognitive readiness.

Figure 1. Comparison chart

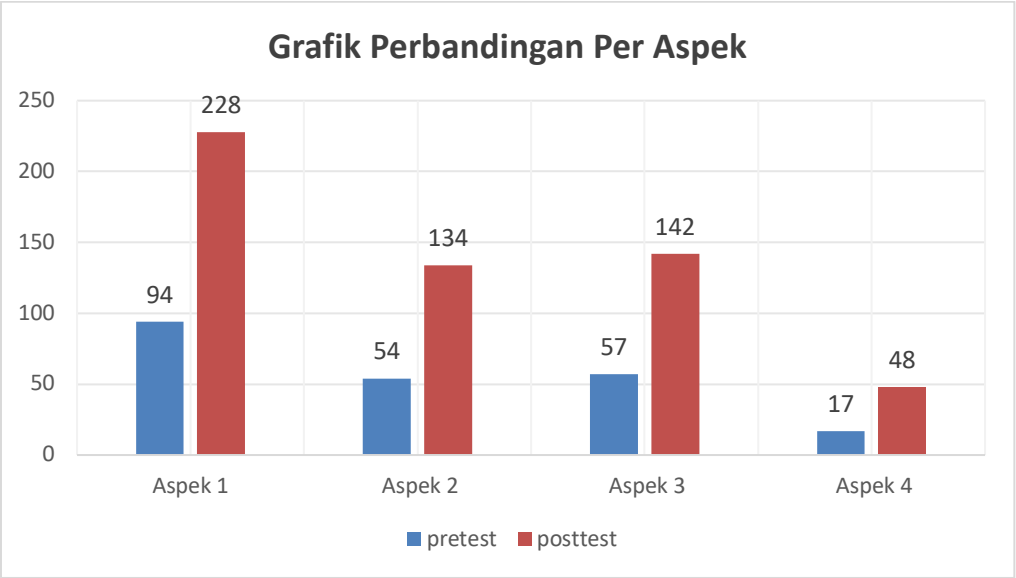

Figure 1.

A detailed comparison across the four measured aspects also indicated marked improvement. The first aspect, counting, showed the most substantial increase—from a total pretest score of 94 to 228 in the posttest—representing a 134-point rise. The second aspect, rote counting, improved from 54 to 134 (an increase of 80 points). The third aspect, associating numbers with quantities, rose from 57 to 142 (an 85-point improvement), while the fourth aspect, comparing quantities, increased from 17 to 48, showing progress even though the magnitude of change was smaller. Overall, all four aspects demonstrated notable gains, confirming that the congklak-based learning intervention successfully enhanced children's understanding of number concepts.

2. *Discussion*

The use of congklak game tools is suitable for improving the ability of number concepts in children aged 4-5 years. Where the process of using the media is carried out in 10 treatments 1 time pretest and 1 time posttest. As stated by (Kelas et al., 2023), the initial test is also known as a pretest, aims to identify students' knowledge that they already know and connect it with new lessons, thus producing a value that shows student behavior or achievement. According to (Purwanto, 2004) the posttest is conducted to determine how well students receive the subject matter (knowledge and skills) after learning activities.

As we can see, the direct learning process delivered by the teacher to the children looks very enthusiastic when the teacher explains how to use the game of congklak. The results of the research show that, before and after using the congklak media, there is a significant influence between the ability of the number concept of children aged 4-5 years.

The results of research calculations show that the use of congklak game tools can significantly improve the ability of number concepts in children aged 4-5 years. Comparison of children's number concept ability scores before and after therapy shows a clear increase. This shows that this learning media is effective in helping children recognize number concepts. Parents and teachers expect this improvement so that children do not experience difficulties when learning. According to (Rasyid & Rohani 2018) the use of learning media is not an additional function, instead it has a special role to convey learning, make the learning process more interactive, make learning interesting for students, improve learning outcomes and make the teacher's role more productive. It can be seen from the recapitulation of pretest data calculations that a total score of 222 from 13 children has been obtained. The minimum value of the child is at a score of 15 and the maximum value is at a score of 21. then the average or mean value is obtained 18 with a media value of 17 and a mode value of 17. the variance in this pretest data is 2.74 with a standard deviation of 1.66. the data shows that the ability of the number concept of children in class A1 RA Al Madinah is still in the developmental stage.

After the pretest activity is completed and the results are obtained, the next activity is for the researcher to provide treatment or treatment for the researcher's next activity to carry out posttest activities. Posttest activities aim to get the final score of the ability of the number concept of children aged 4-5 years in group A1 after being given treatment or treatment. The posttest score will then be used as a comparison material with the score from the results of the previous pretest activity. Furthermore, this value will be used as a basis for determining whether or not there is an effect of congklak game activities on the ability of the number concept of children aged 4-5 years at RA Al Madinah.

When conducting pretests during the investigation, we found several cases that indicated the need for countermeasures and improvements. For example, ABAR and DK children still had difficulty in recognizing the number of objects and relating them to numbers. When asked to count concrete objects, they tended to guess or jump numbers without the correct order, the children also seemed confused to distinguish which amount was more or less. To stimulate the understanding of the concept of number, researchers used the traditional game of congklak which involves the activity of counting seeds one by one into the hole of the congklak board. Children are invited to play while counting and comparing the number of seeds, so that they learn the concepts of number, order, and addition in a natural and fun way. According to Munandar (2009), the development of children's cognitive abilities, including the understanding of number concepts, can be improved through games that involve direct experience and exploration of concrete objects.

APR, DA and HMS still have difficulty recognizing numbers and have not been able to count objects in order correctly. So that when playing congklak, children often put seeds randomly without counting carefully, to overcome this problem the teacher invites APR, DA and HMS to play congklak slowly while counting the seeds one by one in a loud voice. The teacher also gave encouragement and praise to keep the children focused and happy while playing. With this strategy, children are trained to be more careful and concentrated, and understand the concept of number and number order through fun play experiences.

From the results of the calculation of posttest data that has been carried out, a total score of 552 was obtained from 13 children. Then the minimum value is at a score of 41 and the maximum value is at a score of 45. seen from these data the score results have increased from the previous pretest score data. The increase can also be seen from the average results of the pretest data which was previously at a score of 18 to 42.46 in the posttest score. So that if analyzed from the results of these data, there is an increase and positive changes in the ability of children's number concepts after treatment for 10 meetings.

Based on the results of the data analysis above, it shows that the congklak game tool contributes positively and significantly to the improvement of the ability of the number concept of children aged 4-5 years at RA Al Madinah. This shows that cognitive skills in children are greatly influenced. This can be seen from the comparison of children's ability scores before and after treatment.

This study shows that the use of congklak game media not only improves students' number concept recognition skills, but also helps them achieve higher aspects of number concept understanding. The first aspect, "Counting" where students who were given the congklak game media were more able to improve their understanding of counting in the given way. This shows that they have built their understanding and improved their ability in counting. The second aspect, "Counting"

in using the congklak game students are often asked to mention numbers in sequence. This activity helps students develop the ability to recognize numbers which is important in understanding number concepts. The third aspect is "Connecting" where students are asked to connect the concept of numbers with real objects. Students can match the number with the number present, this helps students recognize how many objects there are and also provides student understanding in distinguishing numbers which can help improve understanding of number concepts. Finally, the fourth aspect is "Comparing", students are asked to compare more numbers, this helps students to know larger and smaller numbers, of course this helps students to know the smallest to largest numbers.

Based on the results of the regression test analysis, sig (p) = 0.006 ($p < 0.05$) means that there is a significant influence between congklak games on the ability of number concepts, which means that the hypothesis is accepted. The results of this study are in line with the results of research conducted by Putri Budiani Dolok Saribu (2018) on the effect of traditional congklak games on the counting ability of children aged 4-5 years with the results of the influence of the Implementation of Traditional Congklak Games on the initial counting ability of children aged 4-5 years at KB Tunas Harapan. Furthermore, research conducted by Tiar Asfiyatul Akhida (2014) on the influence of traditional games of congklak on cognitive development of early childhood with the results through playing congklak activities affect the cognitive ability of counting children in Aisyiyah Beruk 1 Karanganyar kindergarten group B.

When viewed from the magnitude of the results of $R^2$of = 0.515 (51.5%) this reinforces that the game of congklak has a large contribution to the ability of children's number concepts and is thought to be 48.5% influenced by other factors not examined in this study. Based on the results of the above research, it is found that there is an effect of using congklak game tools on the ability to recognize the concept of numbers in children aged 4-5 years at RA Al-Madinah.

Conclusion

Based on the results of data analysis and discussion, this study concludes that the ability of children aged 4–5 years at RA Al-Madinah Jakarta to recognize number concepts was initially still underdeveloped. The pretest results showed an average score of 18, placing most children in the “Starting to Develop” category. This indicates that their skills in counting, associating numbers with quantities, and comparing amounts were still limited. One of the main factors contributing to this condition was the teacher-centered learning approach previously applied, which restricted children’s active involvement in the learning process. Consequently, children’s understanding of numerical concepts remained at a superficial, memorization-based level.

After the implementation of learning activities using the congklak educational game for ten sessions, there was a significant improvement in children’s ability to recognize number concepts. The posttest results showed a mean score increase to

42.46, categorized as "Developing as Expected." This improvement demonstrates a positive transformation in children's cognitive abilities, particularly in understanding concrete mathematical ideas. In addition to cognitive gains, the congklak game succeeded in fostering children's engagement and enthusiasm during learning. The interactive nature of the game allowed children to learn through direct experience—counting, comparing, and reasoning—making learning mathematics a joyful and meaningful process.

The statistical analysis using simple linear regression revealed a significance value of $p = 0.006$ ($p < 0.05$) and a coefficient of determination (R^2) of 0.515, confirming that the congklak game contributed 51.5% to the improvement of children's numeracy skills. This finding means that the congklak medium not only provided practical benefits but also had a statistically significant effect on learning outcomes. The results validate the alternative hypothesis (Ha) and reject the null hypothesis (Ho), demonstrating that congklak is an effective educational tool in enhancing early numeracy understanding.

The novelty of this study lies in the integration of a traditional cultural game—congklak—as an innovative, environment-based learning medium for teaching number concepts in early childhood education. While previous studies have examined congklak in general cognitive development, this research specifically measured its quantitative impact on children's number concept recognition using an experimental design and statistical validation. Moreover, this study contributes to the field of early mathematics education by combining cultural preservation with cognitive learning strategies, aligning traditional values with modern educational needs. The use of congklak as a sustainable and culturally rooted educational game also supports the principles of eco-friendly and context-based learning, which have rarely been empirically explored in early childhood education research in Indonesia.

The findings of this study have several important implications for theory, practice, and policy. Theoretically, the results strengthen the constructivist view that children build mathematical understanding through active exploration and manipulation of concrete materials. Practically, the study provides evidence that traditional games can serve as effective pedagogical tools in early numeracy learning, offering an alternative to teacher-centered and worksheet-based methods. Teachers are encouraged to incorporate congklak and other traditional games into classroom practice to promote active participation, problem-solving, and joyful learning experiences.

From a policy perspective, the success of this study supports the inclusion of local culture-based and environment-friendly learning approaches within the Early Childhood Education curriculum. Such approaches not only improve cognitive outcomes but also foster social interaction, creativity, and cultural appreciation among young learners. Therefore, integrating traditional educational games like congklak into classroom activities can help achieve holistic child development—encompassing

cognitive, social, and emotional growth—while preserving Indonesia's cultural heritage.

In conclusion, this study contributes new empirical evidence showing that the congklak educational game is an effective, engaging, and culturally relevant learning tool for enhancing children's understanding of number concepts. It demonstrates that meaningful learning can emerge from play rooted in local tradition, bridging the gap between culture and modern pedagogy.

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