

Play, Count, and Preserve: Integrating Congklak into Early Childhood Mathematics Learning

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Abstract. Early childhood mathematics learning requires meaningful and concrete experiences that are appropriate to children's developmental characteristics. Traditional games can provide such experiences while simultaneously introducing children to local cultural heritage. This study aims to explore the integration of congklak, a traditional Indonesian game, into early childhood mathematics learning from the perspectives of early numeracy development and cultural preservation. The study employed an exploratory case study with a qualitative approach. The research was conducted in Kludan Village, Sidoarjo Regency, East Java, involving children aged 5–6 years who participated in congklak activities. Data were collected through direct observation, documentation, and field notes during three observation sessions. Data were analyzed through data reduction, data presentation, and conclusion drawing and verification. The findings indicate that congklak provides a meaningful context for children's mathematical experiences through direct and playful activities. Several mathematical concepts emerged during the game, including counting, one-to-one correspondence, quantity recognition, quantity comparison, sequencing, and simple problem-solving. In addition to mathematical experiences, children demonstrated social behaviors such as taking turns, following rules, interacting with peers, and helping others. The integration of congklak also provided children with direct experiences of a traditional Indonesian game, creating opportunities to introduce and preserve local cultural heritage from an early age. These findings suggest that congklak can serve as a contextual, enjoyable, and culturally responsive medium for early childhood mathematics learning by connecting play, early numeracy experiences, and cultural preservation.

Keywords: *congklak; early numeracy; traditional games, cultural preservation*

INTRODUCTION

Mathematics is an important field in children's cognitive development from an early age because it enables children to develop logical, systematic, and analytical thinking [1]. Mathematics learning in early childhood should be adapted to children's cognitive developmental characteristics, as described by Piaget, particularly during the preoperational stage, which gradually progresses toward the concrete operational stage [2]. At this stage, children learn optimally through direct experiences, exploration of concrete objects, and enjoyable play activities. Therefore, a play-based learning approach is relevant to early childhood education because it allows children to gain learning experiences through meaningful activities [3]. Mathematical experiences gained through play may also support stronger understanding of number concepts than conventional forms of instruction.

However, mathematics learning practices in many early childhood education settings tend to be dominated by worksheets and formal academic activities. Such conditions may limit children's active engagement and reduce their interest in mathematics. Mayasari and Aulina [4] reported that children's low numeracy abilities are partly associated with the use of less engaging learning media and limited opportunities for play. In their study, the implementation of congklak increased children's numeracy achievement from 9% at the initial stage to 81% at the final cycle. Research by Rianti et al. also indicates that congklak helps children understand number concepts concretely through the manipulation of real objects during play [5].

Traditional games constitute an important part of children's play experiences, offering educational value and opportunities to support various aspects of child development. However, the advancement of technology and children's increasing interest in modern forms of entertainment, such as online games and video games, have contributed to the declining use of traditional games [6]. One traditional game with mathematical elements is congklak. The game involves distributing seeds into holes on a board in turn, thereby engaging children in counting activities and strategic decision-making [7]. From a mathematical

perspective, congklak can introduce counting, one-to-one correspondence, number composition and decomposition, as well as addition and subtraction through concrete experiences. In addition, congklak can foster strategic thinking, self-control, honesty, and social interaction [8].

Beyond supporting numeracy, integrating congklak into learning has important implications for local cultural preservation. The Merdeka Curriculum encourages the use of local wisdom as an authentic, relevant, and meaningful learning resource [9]. From an ethnomathematical perspective, traditional games can serve as a bridge between children's informal mathematical knowledge and formal mathematical concepts [10]. Thus, congklak functions not only as a mathematics learning medium but also as a means of introducing and preserving cultural heritage from an early age. Based on these considerations, this study aims to explore the integration of congklak into early childhood mathematics learning from the perspectives of numeracy and cultural preservation. This study is expected to contribute to the development of enjoyable, contextual, and local-wisdom-based mathematics learning.

METHODS

Study Area

The study was conducted in Kludan Village, Sidoarjo Regency, East Java. The research site was selected as a context for exploring the use of the traditional congklak game in early childhood mathematics learning. The research setting was an important component of the case study because the phenomenon was examined in a real-life context, allowing the researchers to gain a deeper understanding of the participants' activities and experiences.

Research Design

This study employed an exploratory case study with a qualitative approach. A case study is a research approach used to investigate a phenomenon in depth within its real-life context, particularly when the boundaries between the phenomenon and its context are not clearly distinguishable. Meanwhile, a qualitative approach is used to understand meanings, processes, and experiences that emerge within a particular context through naturally occurring data [11].

An exploratory case study design was selected to develop an understanding of how congklak can be integrated into mathematics learning for young children. The case examined in this study was the implementation of congklak as a play activity containing mathematical learning experiences among children aged 5–6 years. The exploration focused on children's activities during the game, particularly activities related to number recognition, counting, recognizing quantities, and comparing quantities.

Participants

The participants were children aged 5–6 years who were involved in congklak activities. Participant selection was aligned with the focus of the study, namely exploring mathematical learning experiences emerging through a traditional game. In qualitative research, participants are selected based on their relevance to the phenomenon being investigated so that the resulting data can provide an in-depth understanding of the case [11].

Data Collection

Data were collected through observation, documentation, and field notes. The use of multiple data collection techniques enabled the researchers to obtain more comprehensive information about the phenomenon under investigation. Direct observations were conducted while the children participated in congklak activities. The observations focused on children's activities when counting congklak seeds, moving seeds from one hole to another, recognizing quantities, determining the number of objects, and following the rules of the game. Children's interactions and responses during play were also observed.

Documentation was used as supporting data in the form of photographs and other records depicting the implementation of the congklak activities. The documentation strengthened the observation data and provided contextual information about the research activities.

Field notes were used to record findings that emerged during the observation process. The notes included children's behaviors, spontaneous responses, counting strategies, interactions during play, and other events relevant to the research focus. Field notes are important in qualitative research because they help researchers capture the context and findings that emerge during data collection [11].

Research Procedure

The research procedure consisted of several stages. First, the preparation stage involved determining the research site and participants, preparing the congklak game, and establishing the observation focus. At this stage, the researchers determined the mathematical activities to be observed during play.

Second, the congklak game was implemented. The children were introduced to the game equipment and basic rules of congklak. They were then given opportunities to play the game directly. Throughout the activity, the researchers observed children's activities and responses, particularly those indicating mathematical learning experiences such as counting, recognizing quantities, and comparing quantities.

Third, documentation and data recording were conducted. The researchers documented the activities and recorded important findings that emerged during play through field notes. All data were collected within the natural context of the play activity.

Fourth, the data were analyzed and interpreted systematically to identify patterns in the mathematical activities that emerged during congklak play.

Data Analysis

Data analysis followed three stages: data reduction, data presentation, and conclusion drawing and verification [12]. During data reduction, the researchers selected, focused, simplified, and categorized data from observations, documentation, and field notes according to the research focus. The data were then grouped based on the mathematical activities observed during congklak play.

Data presentation involved organizing the reduced data into narrative descriptions and thematic categories. This stage was used to describe children's play activities and the mathematical experiences that emerged, including counting, recognizing quantities, and comparing quantities.

The final stage involved drawing and verifying conclusions. The researchers interpreted patterns and relationships among the findings to develop an understanding of the use of congklak as a context for mathematics learning among children aged 5–6 years. Conclusions were based on the overall data collected during the study and were continuously verified throughout the analysis process [12].

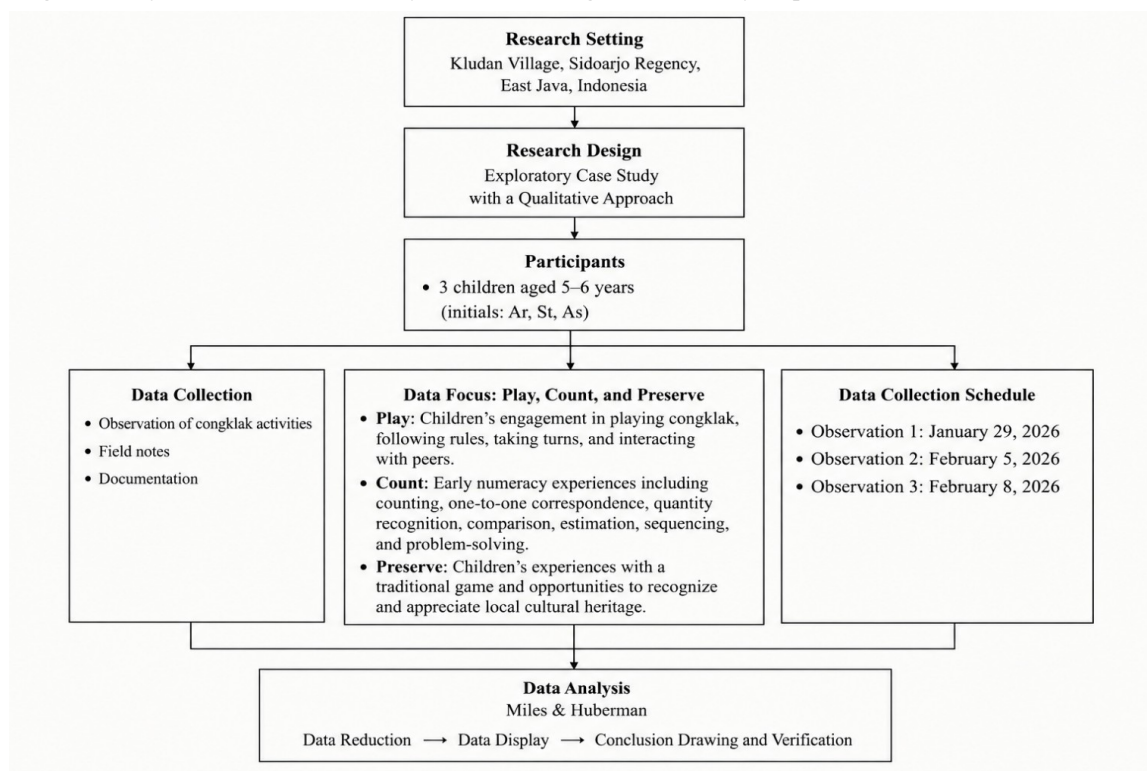


Figure 1. Research Methodology Framework

RESULTS AND DISCUSSION

The findings were obtained from three observation sessions involving children aged 5–6 years who played congklak in Kludan Village, Sidoarjo Regency. Data were obtained through observations, documentation, and field notes. The observations identified several mathematical experiences emerging during congklak play, including counting, one-to-one correspondence, quantity recognition and

comparison, sequencing, and simple problem-solving. In addition to mathematical experiences, the game also revealed children's social interaction and independence during play.

Date : January 29, 2026		
		
Figure 2. Children playing congklak following instructions from the observer	Figure 3. children distributing congklak seeds according to the sequence	Figure 4. children taking turns playing congklak with their peers
Date : February 05, 2026		
		
Figure 5. children distributing congklak seeds according to the prescribed sequence	Figure 6. children playing congklak while counting the seeds	
Date: February 08, 2026		
		
Figure 7. Children comparing quantities of congklak seeds to identify greater and smaller	Figure 8. Children recording the number of congklak seeds obtained in their respective home or storehouse	

1. Play : Congklak as a Meaningful Learning Activity

The findings show that congklak is a play activity that can actively engage children in the learning process. During the activity, children did not merely listen to the researcher's instructions but directly participated in taking, moving, and distributing congklak seeds, taking turns, and applying the rules of the game. Such engagement indicates that learning occurred through active and concrete play experiences. In subsequent observations, the children appeared increasingly familiar with the game and were able to complete several stages with less assistance. This condition suggests that congklak can create a learning situation that retains key characteristics of children's play, including exploration, direct action, and interaction with peers. This finding is consistent with [13], who emphasized that the use of congklak in early childhood mathematics learning can increase children's interest and active participation while helping them follow game rules. Their study positioned congklak as a play-based learning strategy that provides concrete experiences for young children. The present findings reinforce the view that congklak is not

merely a means of teaching mathematical content but also a play activity that enables children to participate directly in the learning process.

Mathematics learning for young children should be adapted to their developmental stages through concrete, enjoyable, and meaningful experiences. According to Siregar [1] emphasizes that mathematics learning in early childhood should be introduced gradually and aligned with children's developmental characteristics, enabling them to understand mathematical concepts through experiences that are relevant to their everyday lives. In line with this perspective, Amanda and Wahyuningsih [3] highlight that play-based learning can create enjoyable learning experiences and encourage children's active participation through play activities. In the present study, the congklak game provides a concrete learning experience by utilizing congklak seeds as tangible objects that can be counted, grouped, and manipulated directly. Thus, congklak is not merely a recreational activity but also serves as a meaningful learning medium through which children can develop their understanding of number concepts through active and engaging play experiences.

The playful nature of congklak was also evident in peer interactions. Children learned to wait for their turns, observe their peers' actions, remind one another of the rules, and provide assistance when a peer encountered difficulties. This finding is consistent with research on traditional games in early childhood showing that such games can create social experiences through communication, collaboration, turn-taking, and peer interaction. Christiantia et al. [14], for example, reported that traditional games can provide an environment that supports the development of social skills in early childhood through play activities involving peer interaction.

Children's participation in congklak is also important in relation to the characteristics of early childhood learning, in which play constitutes a central component of children's learning experiences. Mayasari and Aulina [4] found that the use of congklak in numeracy learning provided opportunities for children to learn through more engaging activities involving direct counting practice. Their study also highlighted challenges associated with learning that relies heavily on worksheets and less engaging media, whereas congklak offers an alternative activity that involves children more actively. The present study therefore extends the understanding of congklak beyond its role in improving counting skills, highlighting its value as a play context in which diverse mathematical experiences can emerge.

The main value of congklak as a play activity lies in children's active participation in carrying out the game. Children learn through direct experience, follow game rules, communicate with peers, and make decisions while playing. This finding is important because it suggests that mathematics learning through congklak does not need to transform the traditional game into a rigid academic activity. Instead, the playful elements of congklak can be maintained as a context in which learning experiences emerge naturally.

2. Count : Mathematical Experiences Through Congklak

One of the main findings of the study was the emergence of counting and one-to-one correspondence during play. Children counted seeds sequentially as they took and distributed them into the holes. They also recounted the seeds when they wanted to confirm the quantity available. In addition, children observed the number of seeds in different holes and identified groups containing more or fewer seeds. This finding supports the research of Rianti et al. [5], which indicates that congklak can facilitate children's understanding of number concepts through the manipulation of concrete objects. In the present study, the use of congklak seeds provided children with direct mathematical experiences because each spoken number was connected to an object that could be seen and moved. Thus, counting was not an isolated activity but was integrated into children's actions during play.

During the first observation, a child identified as Ar counted the congklak seeds one by one before placing them into the holes. The child said "one, two, three, four, five" sequentially according to the number of seeds being moved. Similar activities were observed among St and As when it was their turn to play. This activity illustrates one-to-one correspondence, in which children connect one object with one spoken number. The children did not merely recite the number sequence; they simultaneously moved one seed at a time into the holes. In subsequent observations, counting continued consistently when children took, distributed, and recounted the congklak seeds. These findings indicate that congklak provides concrete objects through which children can experience counting through play, rather than receiving number concepts solely through abstract exercises.

In addition to counting, quantity comparison showed that children's mathematical experiences extended beyond the ability to state a number sequence. Children used counting results to understand relationships among quantities, such as distinguishing larger and smaller quantities. In subsequent observations, children also appeared to estimate quantities before counting them and then counted the seeds to verify their estimates. This indicates an exploration of quantity and basic estimation arising from play. Compared with

previous studies that have primarily focused on congklak as a tool for improving counting skills, the present study reveals broader potential. The structure of the game allows children to experience several mathematical concepts simultaneously, including counting, one-to-one correspondence, quantity, comparison, and sequencing. Congklak can therefore be viewed as a mathematics learning context that enables children to develop understanding through play.

These findings also reinforce Mayasari and Aulina [4], who reported that congklak can support children's counting abilities. However, the present study differs in that it does not emphasize changes in counting performance based on percentage scores; rather, it explores how mathematical experiences emerge as children participate in congklak play.

Table 1. Mathematical Aspects Emerging During Congklak Play

Mathematical Aspect	Observation Findings
Counting	Children counted congklak seeds one by one while taking and distributing them into the holes while saying "one, two, three, four..."
One-to-one correspondence	Children connected one seed with one number as they placed the seeds into the holes sequentially following the direction of the congklak board.
Quantity recognition	Children counted the seeds to determine the quantity in a hole before playing and at the end of the game. They also counted the final number of seeds collected in each player's store and wrote the corresponding number.
Quantity comparison	Children compared quantities to determine which hole contained more or fewer seeds. For example, when one hole contained six seeds and another contained five, the child stated that six was greater.
Sequencing	Children followed the sequence of holes when distributing the seeds, moving gradually from the smaller-numbered holes toward the larger-numbered holes.
Simple problem-solving	Children recounted the seeds when they lost count or made an error while distributing the seeds.

Overall, the findings indicate that congklak has potential as a concrete and meaningful context for mathematics learning among children aged 5–6 years. Mathematical activities emerged as an integral part of the game mechanism. Children counted because counting was necessary to take and distribute the seeds, rather than because they were assigned a separate counting exercise. Thus, mathematical experiences occurred within a play situation that directly involved children with concrete objects.

Counting and one-to-one correspondence were among the most prominent findings. When children took and distributed the seeds one by one while saying the numbers aloud, they had opportunities to connect numbers with the objects being counted. The use of seeds as concrete materials enabled children to experience quantity through manipulation. This demonstrates that traditional games can provide a context for introducing early mathematical concepts through play. The findings concerning quantity comparison further indicate that children's mathematical experiences developed beyond simply reciting a number sequence toward using numbers to understand relationships among quantities. When children identified that one hole contained more seeds than another, they recounted the seeds to confirm the difference. This process shows that counting can serve as a basis for understanding quantity and making simple comparisons.

The observations further revealed that congklak play provided children with mathematical experiences related to sequencing and simple problem-solving. Children followed the sequence of the holes when distributing the congklak seeds, moving systematically from one hole to the next according to the rules of the game. When children made an error or lost track of the counting sequence, they attempted to recount the seeds and adjust their actions to continue the game. This process demonstrated that children were able to recognize and maintain the sequence of their actions while responding to simple problems that emerged during play. These findings suggest that congklak provides opportunities for children to engage in mathematical thinking through direct and meaningful play experiences.

Congklak also demonstrated a connection between mathematical experiences and social interaction. Children took turns, followed rules, shared information about the number of seeds, and helped peers when they experienced difficulties. Therefore, learning through congklak integrated cognitive and social aspects. Overall, the findings indicate that congklak can serve as a play-based mathematics learning context for children aged 5–6 years by providing experiences in counting, one-to-one correspondence, quantity recognition, comparison, estimation, and sequencing through direct activity. At the same time, using a traditional game in learning provides children with opportunities to engage with a form of cultural heritage that can be introduced and sustained through play.

3. Preserve : Congklak as a Traditional Game and a Means of Cultural Preservation

In addition to its mathematical aspects, this study highlights the cultural dimension of incorporating congklak into early childhood education. Congklak is a traditional game that uses rules, materials, and ways of playing that have been recognized within Indonesian culture. When congklak was introduced into the learning process, the children not only engaged with mathematical concepts but also gained direct experience with a traditional game. Purnamasari and Sefriyanti [15] found that playing congklak with children aged 5–6 years can help them develop a better understanding of local cultural heritage. Their study also showed that the use of congklak in learning can increase children's learning engagement and support their understanding of local cultural values. Consistent with these findings, the present study observed that the children showed sustained interest in playing congklak throughout the three days of observation and repeatedly wanted to engage in the game again. This sustained interest suggests that congklak can provide an enjoyable and meaningful way for children to experience traditional cultural practices. Introducing congklak from an early age may therefore provide an opportunity to familiarize children with local cultural heritage through direct participation in a culturally meaningful activity.

Traditional games can provide children with opportunities to develop not only cognitive skills but also social and character-related values through direct interaction during play. Tusolihah et al. [16] found that congklak contains cultural values such as honesty, accuracy, patience, and sharing, while its gameplay involves mathematical activities related to counting, distributing, and comparing quantities. These values were also reflected in the present study, particularly through children's ability to follow the rules, wait for their turns, and carefully distribute the congklak seeds. The children also demonstrated social engagement by interacting with their peers and assisting friends who experienced difficulties during the game. The process of waiting for turns required children to exercise patience and self-control, while counting and moving the seeds encouraged them to act carefully and accurately. These findings indicate that congklak provides an integrated play experience in which mathematical learning is accompanied by opportunities to develop social interaction, patience, responsibility, and positive attitudes toward peers. Therefore, congklak can be considered not only a traditional mathematical learning medium but also a culturally meaningful activity that supports children's broader development.

From an ethnomathematical perspective, the findings of this study demonstrate that mathematical activities can be observed within cultural practices associated with everyday life. Rosa and Orey [17] argue that ethnomathematics can serve as a bridge between mathematical knowledge embedded in everyday experiences and formal mathematics. In this study, congklak exemplifies this connection, as concepts of numbers and quantities emerged through a culturally situated play activity. In addition to its mathematical value, the use of traditional games in learning is relevant to efforts to maintain the existence of traditional games amid children's increasing interest in modern games. According to Maghfiroh [6] found that the development of modern games has contributed to the declining use of traditional games, even though traditional games contain meaningful life values and can contribute to the preservation of local culture. In the context of the present study, introducing congklak through learning activities provides children with opportunities to directly experience and practice a traditional game. The integration of congklak into mathematics learning therefore serves two interconnected purposes. First, congklak provides children with an opportunity to explore mathematical concepts through play. Second, it introduces children to a traditional game, thereby contributing to cultural preservation from an early age. This finding reinforces the view that learning rooted in local wisdom can provide children with learning experiences that are more relevant to and connected with their surrounding environment.

From a cultural perspective, congklak can be understood as part of a cultural heritage transmitted through processes of introduction and intergenerational practice. When congklak is introduced to children through educational activities, schools and early childhood education settings can serve as spaces for maintaining the continuity of the game. According to Hamdani et al. [18] specifically highlighted the historical and cultural value of congklak and its potential as a medium for increasing cultural awareness among younger generations. Their study also identified values such as patience, collaboration, and mutual respect within congklak play, suggesting that traditional games can simultaneously strengthen social relationships and support cultural preservation. This supports the present finding that children's direct involvement in congklak is not only a play experience but also an opportunity to introduce a cultural form that can be passed on to future generations.

Previous studies, such as Mayasari and Aulina [4], have shown that congklak can support children's counting abilities, while research by Rianti et al. emphasizes its role in helping children understand number concepts through concrete objects. The present study complements these findings by exploring the mathematical learning experiences that emerge naturally as children play congklak. The findings show that play involves not only counting but also one-to-one correspondence, quantity recognition, comparison, simple estimation, sequencing, and problem-solving. In addition, this study views congklak not only as a

mathematics learning medium but also as part of the process of introducing and preserving traditional games. Therefore, the contribution of this study lies in portraying congklak as a learning context that connects play, early numeracy development, and cultural preservation.

CONCLUSION

This study shows that congklak can serve as a meaningful context for early childhood mathematics learning through concrete and contextual play experiences. Exploration of the activities of children aged 5–6 years revealed various mathematical experiences during the game, including counting, one-to-one correspondence, quantity recognition and comparison, simple estimation, sequencing, and simple problem-solving. These concepts emerged naturally because children needed to use mathematical ideas to follow the rules and mechanics of the game.

In addition to mathematical experiences, congklak provided opportunities for children to develop independence, follow rules, take turns, interact with peers, and help one another during play. This indicates that congklak can provide learning experiences that involve not only cognitive development but also social interaction. Furthermore, integrating congklak into mathematics learning has cultural value because it introduces children to a traditional game through direct experience. Thus, congklak can be positioned as a local-wisdom-based learning context that connects play, early numeracy experiences, and cultural awareness.

Future research may explore the implementation of congklak with larger and more diverse groups of participants and in different learning contexts. Quantitative or mixed-method studies may also be conducted to examine children's mathematical development more systematically.

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