

The Impact of the Snakes and Ladders Numbers Game on Early Childhood Numeracy Skills in West Bandung

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Abstract

Purpose	: This study aims to explore the use of the "Number Snakes and Ladders" game as an instructional medium to strengthen early numeracy skills in children aged 5–6 years at RA At-Taufiq, Bandung Barat.
Methodology	: This study employed a descriptive qualitative approach involving 10 children from Class B, with the classroom teacher serving as facilitator. Data were collected through participatory observation, semi-structured interviews, and documentation, then analyzed thematically following the Miles, Huberman, and Saldaña model.
Results	: The analysis yielded three key themes. First, from a cognitive perspective, children demonstrated notable progress in recognizing number symbols, sequencing numbers up to 50, and applying one-to-one correspondence when moving tokens according to dice rolls. Second, socially and emotionally, the game nurtured cooperation, patience, and peer support, as children encouraged one another, waited for turns, and reflected on errors. Third, motoric engagement was evident as children actively moved tokens and interacted physically with the game board, enhancing concentration and fine motor coordination. Teachers highlighted the game's adaptability, such as integrating challenge cards and visual markers, which sustained motivation and deepened conceptual understanding.
Conclusions	: The findings affirm that Number Snakes and Ladders can serve as an enjoyable, flexible, and developmentally appropriate medium for promoting early numeracy while simultaneously supporting socio-emotional and motoric development. In practical terms, the study provides educators with a simple yet effective strategy that can be easily adapted in classroom settings to make mathematics learning more meaningful and engaging for young children.

Keywords: counting skills, early childhood education, early numeracy, educational games, snakes and ladders

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1. Introduction

Early Childhood Education (ECE) represents a golden stage that plays a decisive role in building the foundation of children's cognitive, affective, and psychomotor abilities. At this phase, the learning experiences provided will directly influence their readiness to progress to the next level of education. One of the cognitive domains that significantly contributes to success in the ECE stage is early counting skills. This ability not only involves recognizing number symbols and sequencing them but also understanding quantity concepts and applying simple calculations in everyday life. Research by Devvi Natasha et al. (2024) emphasizes that counting activities enhance children's ability to recognize numbers while strengthening the connection between number words and the quantity of objects accurately. Similarly, a study by Nurjanah and Suryani (2021) shows that developing counting skills from an early age through structured play activities fosters children's confidence in using numbers, while simultaneously establishing a strong foundation of numeracy for future mathematics learning. These findings indicate that systematic, enjoyable, and meaningful counting practice is essential in preparing early numeracy readiness for young children.

Early numeracy for children aged 5–6 refers to the foundational ability to recognize, represent, and manipulate numbers in meaningful contexts, which serves as a predictor of later mathematical achievement (Duncan et al. 2007; Purpura and Lonigan 2015). This skill is essential not only for understanding basic mathematical concepts but also for fostering problem-solving, logical reasoning, and confidence in handling numerical tasks. Developing numeracy at this stage requires methods that are contextual, playful, and developmentally

appropriate. According to Piaget's theory of cognitive development, children in the preoperational stage (ages 2–7) learn most effectively through direct, hands-on experiences. Activities such as symbolic play and social interaction help them connect concrete actions with abstract ideas (DeVries and Kohlberg 1987; Piaget, 1964).

In a similar vein, Vygotsky (1978) highlighted the importance of scaffolding and collaborative learning within the Zone of Proximal Development. Through interaction with peers and adults, children are able to progress beyond what they can achieve independently and master new skills more rapidly.

Thus, using concrete media and game-based learning, such as the traditional Snakes and Ladders board game, provides children with opportunities to connect counting steps with visual number positions, while simultaneously enhancing social-emotional skills like cooperation, turn-taking, and self-regulation. Recent studies (Usman, Sukmawati, and Romba 2023) confirm that number-based board games enhance not only mathematical fluency but also socio-emotional skills such as cooperation, turn-taking, and self-regulation, that board games with linear numerical tracks significantly improve children's counting accuracy, number sequencing, and one-to-one correspondence, making them powerful tools for strengthening early numeracy in enjoyable and meaningful ways.

Similar findings have been echoed by several recent studies that highlight both global and local evidence for the effectiveness of number-based board games in enhancing early numeracy. A systematic review published in Balladares et al. (2024) conducted a systematic review of 23 years of research and found that number-based board games, such as Snakes and Ladders, significantly improved counting, addition, and number comparison skills in pre-kindergarten to kindergarten children (approximately 3–6 years old), especially when these sessions were guided by teachers or trained adults. Similar results were reported by Devvi Natasha et al. (2024), who highlighted that Snakes and Ladders is not only enjoyable but also effectively improves children's numeracy skills. This is achieved through the application of the one-to-one correspondence principle, in which each movement of the token corresponds to the number shown on the dice. This process allows children to build a more concrete understanding of the relationship between number symbols, number sequences, and the quantity of steps to be taken, making numerical concepts easier to grasp. Locally, at RA At-Taufiq in Bandung Barat, qualitative observations revealed that children began to self-correct errors, collaborate more effectively, and use quantitative language (e.g., "past twenty") during gameplay. These observations were complemented by quantitative field notes showing a steady rise in both accuracy and fluency of counting across sessions. This convergence of qualitative narratives and quantitative measures reinforces the idea that early numeracy development is best captured through both statistical outcomes and children's lived experiences. Moreover, beyond cognitive gains, such playful learning circumstances foster crucial socio-emotional abilities including patience, adherence to rules, and emotional resilience solidifying the role of Snakes and Ladders as a dual-purpose tool for nurturing both mathematical understanding and interpersonal skills.

In addition, Azzahra, Nafiqoh, and Rakhman (2024) demonstrated that Snakes and Ladders can be modified into a more interactive arithmetic teaching aid, enabling children to practice simple operations such as addition and subtraction beyond mere step counting. This flexibility shows that the game can be adapted to various learning objectives and levels of ability. Kuncoro (2024) further found that implementing Snakes and Ladders at TK Cendrawasih II enhanced children's cognitive abilities, particularly in numerical reasoning and concentration. Children not only learned to count but also became accustomed to focusing on rules, planning moves, and strengthening logical thinking in an enjoyable way. Supporting these findings, Royani & Suryana (2023) reported that playing Snakes and Ladders significantly improved children's understanding of number concepts, highlighting its potential as a developmentally appropriate learning strategy in early childhood classrooms. Similarly, Fikriyah, Priyanti, and Iskandar (2024) confirmed that the integration of Snakes and Ladders in numeracy instruction for children aged 5–6 years at PAUD Hidayatut Taufiq Bekasi enhanced both counting fluency and engagement in mathematical activities. With such creative and

adaptive approaches, this simple traditional game can act as an effective bridge between play and learning, supporting both cognitive and socio-emotional development simultaneously.

Although numerous studies have confirmed the effectiveness of Snakes and Ladders in improving early numeracy, most of them remain limited to reporting quantitative gains, such as increases in test scores or accuracy of number recognition. Such approaches, while valuable, often overlook the qualitative dimensions of how learning actually takes place during gameplay. This study addresses that gap by focusing on the process-oriented dynamics how five-year-old children in an RA setting develop and apply counting strategies, engage in self-correction, negotiate turns, and build social interaction skills through the game. Moreover, while previous works have scarcely considered the teacher's role, this study emphasizes the scaffolding practices of the classroom teacher, who mediates rules, provides reflective feedback, and encourages cooperative problem-solving.

The urgency of this research lies in its contextual specificity and methodological contribution. Conducted in a Raudhatul Athfal in Bandung Barat, the study situates Snakes and Ladders within a culturally relevant environment, demonstrating how local adaptations (e.g., challenge cards, reflective discussions) enhance engagement and conceptual depth. By employing a descriptive qualitative approach, it not only verifies the cognitive benefits of the game but also uncovers the social-emotional and metacognitive outcomes that have been largely neglected in prior studies. This combination of insights makes the study both timely and necessary, offering a richer framework for educators seeking sustainable and meaningful strategies to strengthen early numeracy while nurturing holistic child development.

This study presents several novel contributions compared to previous research on the use of Snakes and Ladders in early numeracy learning. First, unlike most earlier works that mainly emphasize quantitative outcomes such as test scores or accuracy in number recognition e.g (Fikriyah et al. 2024; Royani and Suryana 2023), this research adopts a descriptive qualitative approach that explores the learning process in greater depth. The focus is not only on whether children improved their counting skills but also on *how* they developed and applied strategies, corrected their own mistakes, negotiated rules, and interacted socially during gameplay. Second, the study highlights the role of the teacher as a scaffolder, which has received little attention in prior studies. Here, the teacher is shown to mediate the rules, provide reflective feedback, and encourage collaborative problem-solving, thereby enriching both the cognitive and socio-emotional dimensions of learning. Third, the study adds contextual and practical novelty by situating the research in a Raudhatul Athfal (RA) in Bandung Barat and integrating local adaptations, such as challenge cards and reflective discussions. These modifications not only sustained children's engagement but also deepened their conceptual understanding, demonstrating how traditional games can be creatively redesigned to suit specific educational and cultural settings. Taken together, these elements make the study both timely and necessary. It advances theoretical insights into how numeracy emerges through play while offering practical guidance for early childhood educators seeking enjoyable, adaptive, and sustainable strategies to strengthen numeracy and holistic development.

Based on this background, the present study aims to describe the influence of the "Number Snakes and Ladders" game on the early counting skills of children aged 5-6 years using a descriptive qualitative approach. The research focuses on how children identify numbers, count steps according to dice results, understand number sequences, and relate the play experience to basic numeracy concepts. It is expected that the findings will contribute to developing enjoyable, meaningful, and developmentally appropriate numeracy learning strategies for kindergarten or RA settings.

2. Methodology

This study employed a descriptive qualitative approach (Sugiyono 2022) to provide a detailed account of the implementation of the Number Snakes and Ladders game as a learning medium to enhance the early counting skills of children aged 5-6 years at RA At-Taufiq, Bandung Barat. This approach was selected because it allows the researcher to observe, record,

and understand learning processes in a natural setting without imposing excessive intervention.

The research was conducted in August 2025 and involved one group of Class B, consisting of 10 children (5 boys and 5 girls, all aged 5-6 years). The participants came from varied socio-economic family backgrounds, representing the local community of Bandung Barat. The classroom teacher served as a facilitator, while the researcher acted as a participant observer, responsible for documenting interactions, guiding data collection, and ensuring research ethics were upheld. Participants were chosen purposively, focusing on how the children recognized numerical symbols, counted steps according to dice rolls, understood number sequences, and connected the gameplay experience to basic quantity concepts.

The instruments used in this study consisted of a participatory observation sheet, an interview guide, and documentation notes. The observation sheet included indicators such as children's accuracy in counting, fluency in naming number sequences, ability to apply one-to-one correspondence, level of participation during play, and use of quantitative language (e.g., "past twenty"). The interview guide was directed at the classroom teacher, focusing on perceptions of the game's effectiveness, observed challenges, and children's socio-emotional responses during the learning process. Meanwhile, documentation consisted of photographs of learning activities, field notes capturing children's spontaneous behaviors, and records of group reflections. These three instruments complemented one another and were used for triangulation to ensure the validity and reliability of the findings.

Data were collected through three main techniques: (1) participant observation, to capture direct interactions and behavioral responses during play; (2) semi-structured interviews with classroom teachers, to explore teaching strategies, perceptions, and evaluations of play use; and (3) documentation, including field notes to strengthen and validate observational findings. The instruments observation sheets and interview guides were reviewed and validated by two early childhood education experts to ensure content validity and relevance.

To ensure credibility, several verification strategies were implemented, including triangulation (comparing data from observations, interviews, and documentation), member checking (confirming interpretations with the classroom teacher), and peer discussions with academic advisors. Data analysis followed the interactive model of Miles, Huberman, and Saldaña (2024), which consists of three stages: data reduction, data presentation, and drawing/verifying conclusions. These steps were conducted iteratively, allowing themes to emerge and ensuring rigor in interpreting the findings. The overall process is illustrated in the diagram below to provide a visual overview of the analysis.

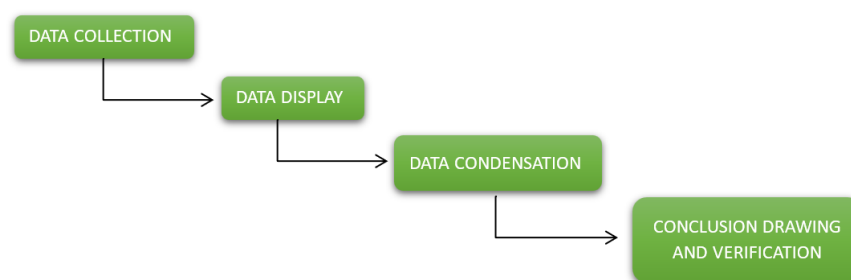


Figure 1. Data Analysis Stages Based on Miles, Huberman, and Saldaña (Miles et al. 2024)

3. Results

3.1. Initial Observation

In the initial observation phase, some children still experienced difficulties with counting, especially when navigating the "teens" (11–19) sequence. Common errors included hesitation when naming numbers, skipping one or two digits, and taking long pauses before recalling the next number. After three sessions of the Number Snakes and Ladders game, most children

showed marked improvement. They were able to count more accurately, name sequences up to 30 fluently, and participate enthusiastically. Several children also began self-correcting their mistakes without teacher assistance, indicating increased confidence and awareness in the learning process.

3.2. Participatory Observation

During participatory observation, children actively engaged with the Number Snakes and Ladders Board, which contained numbers from 1 to 30.

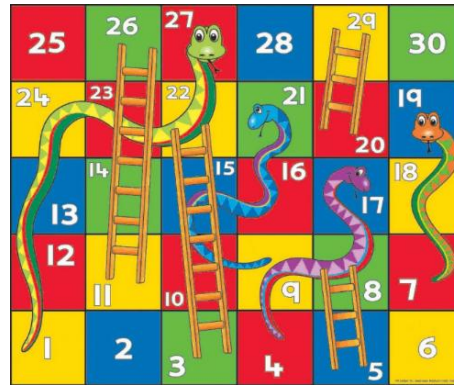


Figure 2. The Number Snakes and Ladders board used in this study

The Snakes and Ladders Number Board used in this study was specifically designed with the numbers 1 through 30 arranged in a linear order. The set consisted of a large board placed on the floor, a six-sided die, and small number tokens representing each child. The rules were simple: each child took turns rolling the die, moving their token forward according to the number rolled, and following the snake or ladder path when encountered. The teacher briefly explained the rules at the beginning of each session and ensured all children understood their turns and the counting process. Once the game began, the children played together under the teacher's guidance.

The board facilitated the connection between dice outcomes and the number of steps required, helping children maintain consistency in one-to-one correspondence. While some children initially hesitated or counted too quickly, with minimal guidance, they achieved better accuracy. Children also interacted socially during play by reminding peers of their turns, correcting miscounts, and encouraging one another. In addition, children spontaneously used quantitative language such as “past twenty” or “almost thirty,” showing an emerging awareness of number positions and ranges.

3.3. Teacher Interview

Interviews with classroom teachers indicated that the Snakes and Ladders Numbers game had a positive impact on children's cognitive and social-emotional development. Teachers reported noticeable behavioral changes throughout the sessions. One teacher explained:

"Initially, many were still hesitant when counting, especially when going past tens. But after playing a few times, they became more fluent, even daring to say the numbers out loud without fear of making mistakes," (Sumiati, Principal of RA At-Taufiq).

Teachers also noted that children appeared more confident when saying numbers or making steps based on dice rolls. Their enthusiasm was reflected in their happy expressions, spontaneous applause, and persistence in trying again after mistakes. Another teacher emphasized the cooperative aspect of the game:

"I saw the children becoming more united. They reminded each other when it was their turn, encouraged their friends, and if someone miscalculated, they corrected it together without getting upset. It was very good for practicing cooperation," (Yuliantini, Teacher at RA At-Taufiq).

Teachers further observed that the children became more patient and consistent in following the game's rules. Although some initially rushed or ignored the rules, over time they demonstrated increased self-control, including gracefully accepting setbacks when encountering snakes. The teachers emphasized that these experiences fostered honesty, responsibility, respect, and sportsmanship. By the final session, nearly all children confidently recognized, named, and identified number symbols up to 30.

4. Discussion

The findings of this study confirm that board games with linear numerical structures, such as Snakes and Ladders, are effective in enhancing early numeracy skills. These results are consistent with Ramani and Siegler (2008), who demonstrated that structured board games significantly improve number sequencing and one-to-one correspondence among preschoolers. More recently, Fikriyah, Priyanti, and Iskandar (2024) reported similar improvements in counting fluency and engagement when Snakes and Ladders was applied in early childhood classrooms, while Prihatini and Mursid (2022) emphasized its role in strengthening number concept comprehension. Participatory observation revealed that during the initial sessions, children often made counting errors, particularly when moving across the “teen” numbers. However, in subsequent sessions, their counting accuracy and speed improved markedly. Some children even spontaneously corrected their peers’ counts, reminded others about their turn, or used quantitative language such as “past twenty” to describe their position. This suggests that the game nurtures not only cognitive numerical skills but also social abilities, such as cooperation and communication. These observations are consistent with Sari and Ismail (2020) findings, which indicate that educational games can stimulate positive peer interaction and increase learning motivation in early childhood settings.

From a theoretical perspective, the children’s progress in number recognition, sequencing, and counting accuracy supports Piaget’s theory that young learners in the preoperational stage acquire abstract concepts more effectively through concrete, hands-on activities (Piaget, 1964). The collaborative aspects observed in this study such as correcting peers, reminding turns, and negotiating moves reflect Vygotsky’s (1978) notion of the Zone of Proximal Development, where peer interaction and teacher mediation accelerate learning. Furthermore, the teacher’s role in guiding post-game reflection resonates with Bruner’s (1983) concept of scaffolding, which underscores the importance of structured support in enabling children to internalize new skills. The novelty of this study lies in showing that the benefits of Snakes and Ladders extend beyond the development of numeracy skills alone; they also depend on the teacher’s facilitative role, particularly in encouraging reflection and cooperative dialogue. This dimension has been underexplored in previous research, making the findings especially relevant for strengthening teacher practices in early childhood classrooms.

Field findings also show an improvement in social skills during play. Children not only learn to count, but also develop the ability to work together, wait their turn, and communicate using quantitative language such as “past twenty” or “almost thirty.” This is consistent with the findings of Sari and Ismail (2020), who emphasized that educational games encourage positive interactions between peers and increase learning motivation in early childhood. From a cognitive perspective, these results are also in line with Prihatini and Mursid (2022) who demonstrated that implementing Snakes and Ladders, particularly in its giant form, can significantly strengthen early childhood cognitive abilities by combining counting practice with problem solving tasks.

Furthermore, integrating educational games with a local cultural approach has great potential to strengthen numeracy learning. Safira et al. (2023) found that embedding cultural values in games enhances children’s mathematical understanding. In this regard, the Number Snakes and Ladders game could be further adapted with local images or folktales, providing not

only numerical practice but also cultural learning aligned with the meaningful learning approach.

Furthermore, interviews with teachers revealed that post-game reflection was crucial in strengthening children's understanding. Each session concluded with a group discussion on calculation errors, playing strategies, and successes. This reflective practice aligns with Bruner's (1983) view on the importance of scaffolding or structured support in maximizing children's learning. Furthermore, these findings support research by Putri and Handayani (2022), which confirmed that post-game reflection improves children's understanding of mathematical concepts and metacognitive skills. Similarly, Lestari and Harfiani (2023) also emphasized that personalized teacher guidance during play can strengthen problem solving skills, foster self-confidence, and foster positive attitudes toward numeracy learning.

Beyond cognitive gains, the study highlights socio-emotional and motor benefits. Children displayed patience, cooperation, and resilience, aligning with Whitebread et al. (2012), who argued that play involving rules fosters executive functions such as self-regulation and problem-solving. Additionally, As et al. (2024) demonstrated that Snakes and Ladders can promote gross motor skills by engaging balance, coordination, and controlled movement. Taken together, the game supports holistic development, encompassing cognitive, social-emotional, and physical domains.

Thus, this research not only confirms earlier findings about the cognitive benefits of Snakes and Ladders but also provides new insights into its reflective and socio-emotional dimensions. By situating the game in a Raudhatul Athfal context with teacher-led scaffolding and culturally meaningful practices, the study contributes a richer understanding of how traditional play can be transformed into sustainable, developmentally appropriate pedagogy for early numeracy.

Overall, the findings illustrate that the Number Snakes and Ladders game successfully integrates interactive, visual, and social elements into one enjoyable learning experience. This approach resonates with Piaget's view that children in the preoperational stage learn best through concrete experiences, while also aligning with Vygotsky's concept of the Zone of Proximal Development, where peer and teacher interactions accelerate skill mastery. At the same time, the reflective practices guided by the teacher demonstrate the value of scaffolding, helping children connect their actions during play with broader numerical concepts. In line with Whitebread et al. (2012), the study further highlights that play-based learning involving imagination, rules, and social interaction strengthens children's executive functions such as planning, self-control, and problem solving which were clearly evident throughout the sessions. Thus, this research not only reinforces existing evidence of the cognitive benefits of Snakes and Ladders but also extends understanding by revealing its reflective and socio-emotional dimensions, showing how traditional games can be transformed into sustainable and culturally responsive pedagogy for early numeracy. The research involved a small sample of only 10 children from one RA, limiting the generalizability of the findings. Future studies with larger and more diverse samples are recommended to validate and extend these results.

5. Conclusion

This study concludes that the Snakes and Ladders game is an effective and enjoyable medium for strengthening early numeracy skills in children aged 5–6 years. Beyond supporting number recognition, sequencing, and one-to-one correspondence, the game also nurtures cooperation, patience, and confidence, while its flexible design allows teachers to adapt it for varied learning objectives. These findings highlight the potential of traditional play to serve as a sustainable, developmentally appropriate strategy that integrates cognitive, social-emotional, and classroom engagement in early childhood education.

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