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Stimulating Early Childhood Symbolic Thinking Skills Through Educational Number Games

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Abstract

Symbolic thinking is an important aspect of early childhood cognitive development, related to the ability to understand symbols, including numbers. However, in practice, many children still experience difficulties in recognizing and using number symbols optimally. This study aims to determine how to stimulate early childhood symbolic thinking through educational number games. This study used a qualitative approach with a case study method. Data were obtained through observation, interviews, and documentation of children aged 5–6 years. The results showed that educational number games can improve children's symbolic thinking skills through several aspects, namely: recognition of number symbols, understanding the relationship between numbers and quantities, symbol classification skills, symbolic representation skills, and increasing children's interest in learning. Thus, educational number games can be an effective strategy in developing early childhood symbolic thinking skills.

INTRODUCTION

Early Childhood Education (PAUD) is a crucial educational stage in providing a foundation for children's development, including cognitive development. During this period, children develop their thinking skills, understand their environment, and construct knowledge through interactions with objects, people, and various learning experiences. One aspect of cognitive development that requires stimulation is symbolic thinking. This ability relates to children's ability to understand and use symbols to represent objects, quantities, or specific concepts (Khotimah & Choerun, 2024). In early mathematics learning, symbolic thinking skills can be seen when children recognize number symbols, understand the meaning of numbers, and connect number symbols with the number of objects. What it represents. According to Jean Piaget's theory of cognitive development, early childhood is in the preoperational stage, where children begin to use symbols in their thinking but still

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need concrete objects to understand abstract concepts.At this stage, children begin to use words, images, and symbols to represent objects in their environment (Nasution et al., 2024).

However, children's understanding of abstract concepts is still developing, so concrete experiences are still necessary in the learning process. Therefore, stimulation of symbolic thinking skills needs to be designed according to children's developmental characteristics, through activities that allow children to observe, experiment, match, and use symbols in meaningful situations.

One form of symbolic thinking ability that is important to develop in early childhood is understanding number symbols. The ability to recognize numbers is not only related to children's ability to say the sequence of numbers or memorize the shape of numbers, but also includes understanding the relationship between number symbols and quantity (Kutfiana et al., 2025). Children who are able to say numbers in sequence do not necessarily understand the number of objects represented by those numbers. Therefore, learning to recognize numbers needs to provide opportunities for children to connect symbols with concrete objects so that numbers are not simply understood as visual forms, but also as symbols with meaning (Khotimah & Choerun, 2024).

In early childhood education (PAUD) learning practices, number recognition is often achieved through conventional methods such as memorization (Syifauzakia, 2023). This results in children lacking a grasp of the meaning of number symbols. However, the ability to understand the relationship between symbols and concrete concepts is at the heart of symbolic thinking (Priyono et al., 2021). Educational games are an effective solution for developing this ability. Educational number games provide a fun and meaningful learning experience, enabling children to understand number concepts concretely (Fatimah et al., 2023). Furthermore, the use of media such as number cards, puzzles, and interactive games has been shown to improve children's symbolic thinking skills (Fitri & Syamsudin, 2019).

One alternative that can be used to support this process is educational number games. Educational number games are play activities designed to provide learning experiences through the use of number symbols and related objects or media (Kriener-althen et al., 2020). Through these games, children can have the opportunity to recognize number shapes, match numbers with the number of objects, distinguish symbols, and use numbers to solve simple challenges (Timoho et al., 2026). Media such as number cards, number puzzles, and concrete objects can be used to provide a more interactive learning experience (Sabran et al., 2023). The use

of media in play activities requires teacher guidance so that children are not only interested in the game but also gain an understanding of the concepts being studied.

Although educational games have been used in early childhood learning, studies on their use need to consider the stimulation process that occurs, rather than simply concluding that games can improve children's abilities. Previous research discussing number cards, educational games, and play activities provides a foundation for the development of symbolic thinking skills. However, contextual studies are still needed that explain how educational number games are implemented, how children respond to these activities, and how children demonstrate understanding of number symbols and the number of objects during the learning process. This gap is a focus that needs further study in research, while still considering the results and context of previous research proportionally.

Based on this background, this study aims to analyze the process of stimulating symbolic thinking skills in children aged 5–6 years through educational number games. Specifically, this study focuses on the recognition of number symbols, understanding the relationship between numbers and quantities, symbol classification, symbolic representation abilities, and children's interest and engagement in learning. This study uses a qualitative approach with a case study method to gain an understanding of the implementation of educational number games and children's responses in the context of early childhood education. The results of the study are expected to provide a contextual overview for educators in designing play activities that support the development of symbolic thinking in early childhood.

METHOD

This research employed a qualitative approach with a case study method. This approach was chosen to gain an in-depth understanding of the process of stimulating symbolic thinking skills in early childhood through educational number games within the context of early childhood education institutions. The qualitative approach allowed researchers to observe the learning process, understand children's responses during the activities, and identify how teachers facilitated the recognition of number symbols and understanding of number concepts. The case study method was used to examine this phenomenon contextually based on the experiences and activities encountered during the research (Waruwu et al., 2025).

Data collection was conducted through observation, interviews, and documentation. First, observations were made of the implementation of the

educational number game, children's involvement, children's responses to number symbols, and children's ability to connect symbols with the number of objects. Aspects observed included recognition of number symbols, understanding the relationship between numbers and quantities, grouping numbers, the use of symbols to represent the number of objects, and children's participation in learning activities. Observations were recorded systematically to obtain an overview of the process of stimulating symbolic thinking skills.

Second, interviews were conducted with teachers to obtain information regarding the purpose of using educational number games, how teachers implemented the activities, children's responses, difficulties encountered, and strategies used to help children understand number symbols. Interviews were conducted based on guidelines developed in accordance with the research focus. Information from the interviews was used to complement and deepen the observation findings. Third, documentation was conducted by collecting relevant documents, such as lesson plans, observation notes, and available photos or documentation of activities obtained with appropriate permission.

Data analysis was conducted qualitatively through the stages of data reduction, data presentation, and conclusion drawing. In the data reduction stage, information from observations, interviews, and documentation was selected and grouped based on the research focus. The data was then presented in descriptive form, describing the implementation process of the educational number game and the findings on each aspect of symbolic thinking skills. Next, the researcher drew conclusions by identifying patterns of findings, similarities or differences in information between sources, and the relationship between play activities and children's learning responses.

RESULTS AND DISCUSSION

This study focuses on stimulating symbolic thinking skills in early childhood through educational number games. Based on the findings reported in the manuscript, the stimulation relates to five aspects: recognition of number symbols, understanding the relationship between numbers and quantities, symbol classification, symbolic representation, and children's learning interests. These five aspects are discussed to explain how educational number games can be a learning tool that helps children understand symbols through play experiences.

Introduction to Number Symbols

Number symbol recognition is a fundamental skill in the

development of symbolic thinking in early childhood. At this stage, children begin to recognize the visual form of numbers and distinguish one symbol from another. Symbol recognition isn't simply achieved through repetitive number-name activities; it requires opportunities for children to observe, select, match, and use number symbols in meaningful activities.

In this research paper, number cards and number puzzles are mentioned as media used to help children recognize symbol shapes. Through these activities, children have the opportunity to observe the visual characteristics of each number and match the symbols displayed. The activity can be directed, for example, by asking children to select a number card named by the teacher, find the same number on two media, or match puzzle pieces with the corresponding symbol.

Conceptually, these activities provide concrete experiences for children to develop an initial understanding of number symbols. Symbols that previously appeared only as visual forms begin to be recognized as meaningful representations in early mathematics learning. However, the ability to name or recognize number shapes must be distinguished from the ability to understand their value. Therefore, observations of children's abilities should also consider whether they can consistently distinguish symbols within the context of play.

The findings regarding number symbol recognition in this study align with the discussion by Ekayanti et al. (2025) regarding the use of visual media to support children's symbolic thinking skills. However, this agreement should be understood as conceptual support for the previous study, not as evidence that the results of the two studies are identical.

Understanding the Relationship between Numbers and Quantities

The ability to connect number symbols with quantities is a crucial part of the development of symbolic thinking. Children need not only to recognize the shape of numbers but also to understand that these symbols can be used to represent specific quantities (Priyono et al., 2021). This understanding lays the foundation for the development of number concepts and mathematical skills at later stages.

Based on the findings described in the manuscript, educational number games provide children with the opportunity to match number symbols with a number of objects. An example of an activity that can be used to stimulate this ability is asking children to match number cards with a collection of objects that have the appropriate number. In practice, teachers can provide concrete objects, such as blocks or other counting objects, then invite children to count the objects and

choose the number symbol that represents that number.

Matching numbers and quantities provides children with the opportunity to connect concrete representations with symbolic representations (Nilsson et al., 2017). Children learn that numbers are not simply memorized names or shapes, but rather relate to quantities. Teachers need to pay attention to the child's process, including the accuracy of counting objects, the ability to select symbols, and the consistency in matching the two.

Learning through concrete objects also allows teachers to identify children's difficulties in a more targeted manner. A child who can name a number sequence may not be able to determine the correct number of objects. Therefore, educational number games should provide opportunities for children to demonstrate understanding through actions, not just verbal responses.

The findings discussed in this manuscript align with the research focus (Syatauw & Rumaf, 2020) on the use of educational games to stimulate symbolic thinking. However, to strengthen the research conclusions, the authors need to include observational evidence showing how children match symbols and numbers, as well as the responses they display when they encounter difficulties.

Number Symbol Classification Ability

Classification is the activity of grouping objects based on certain characteristics or criteria. In learning numbers, grouping activities can be used to provide children with experience in differentiating and organizing symbols based on observable similarities and differences (Tian et al., 2025). This activity also provides opportunities for children to observe the shapes of symbols and use simple rules to complete tasks.

The research paper reports that children are beginning to be able to group numbers into specific categories. This finding needs to be further explained by specifying the type of grouping actually performed during the activity. For example, if it were performed, children could be asked to group cards with the same symbol, separate cards into categories determined by the teacher, or arrange number cards according to game instructions.

Through classification activities, teachers can observe children's ability to notice visual characteristics, distinguish symbols, understand instructions, and maintain grouping rules. However, classifying number symbols must be distinguished from sorting numbers or grouping objects by quantity. This distinction is important to ensure that the observed indicators of symbolic thinking ability are not confused with other cognitive skills.

In the context of early childhood learning, classification activities should be tailored to the child's abilities and presented through simple games. Teachers can provide assistance gradually, then reduce assistance as the child begins to understand the rules of the activity. In this way, the game not only serves as a means of introducing numbers but also provides an opportunity for children to develop simple reasoning.

This discussion relates to Iskandar and Zulaeha's (2022) study on play practices in stimulating symbolic thinking skills. To demonstrate the research's specific contribution, the authors need to include examples of observations of how children group symbols, errors encountered, and the types of assistance provided by teachers.

Symbolic Representation Ability

Symbolic representation refers to the ability to use a symbol to represent a specific object, quantity, or concept. In learning numbers, this ability is evident when children use number symbols to indicate the number of objects or choose the appropriate number for the situation at hand. This ability is an essential part of understanding the relationship between symbols and the meanings they represent.

Based on the description of the results in the manuscript, educational number games are associated with children's ability to use numbers to represent the number of objects. This ability can be observed through activities where children select number cards that correspond to a collection of objects, arrange pairs of numbers and quantities, or use number symbols to complete game tasks. Examples of these activities need to be included as findings only if they were actually carried out during the research.

When assessing symbolic representation skills, researchers need to distinguish between a child's success in following teacher directions and their understanding of the function of symbols. A child who successfully completes a task after receiving extensive assistance may not have the same understanding as a child who is able to complete it independently. Therefore, recording the form of assistance, the child's response, and the consistency of answers can enrich the interpretation of research results.

From a cognitive development perspective, experiences using symbols in concrete situations provide opportunities for children to build connections between representations and the objects they represent. In early childhood education, this process needs to be supported through play activities that allow children to observe,

manipulate objects, try out strategies, and refine their answers.

This finding is related to a study (Paratiwi & Ramadhan, 2023) on stimulating symbolic thinking through stringing activities. However, the authors need to carefully explain the similarities and differences in the context of the two activities. Thus, the discussion does not stop at stating that games are beneficial, but rather demonstrates how the use of numbers relates to the symbolic representation process that is the focus of the research.

Children's Interest and Involvement in Learning

In addition to the ability to recognize and use symbols, children's interest and engagement are important aspects to consider when implementing educational number games. Play activities can create a more engaging learning environment because children have the opportunity to interact with media, try to solve challenges, and participate in activities with teachers and peers.

The research paper states that educational number games create a fun learning environment and are associated with increased motivation and participation in children. This statement needs to be supported by descriptions of observational findings, such as children's involvement in completing tasks, interest in the media used, willingness to try again when faced with difficulties, or initiative in participating in activities. These indicators need only be included if they were observed and recorded during the study.

Learning interest is important to consider because it can support children's opportunities to practice and engage in the learning process. However, a child who appears enthusiastic does not necessarily have mastered number concepts. Therefore, interest and engagement should be analyzed as findings related to the learning process, while symbolic thinking skills are analyzed through responses and actions that demonstrate understanding of symbols.

In practice, teachers can maintain children's engagement through varied games, simple instructions, appropriate levels of difficulty, and opportunities for each child to try. Teachers also need to provide support without taking over the entire task completion process. Thus, educational number games can provide an engaging learning environment while also providing a space for children to demonstrate their developing abilities.

This discussion can be compared with Wulandari's (2025) study on exploration-based games and children's learning interests. The author needs to review the source and ensure that the comparisons align with the focus, methods, and findings of the original research.

Educational Number Games as a Means of Stimulating Symbolic Thinking

Overall, the five aspects discussed demonstrate that stimulating symbolic thinking skills needs to be understood as a process encompassing symbol recognition, quantity interpretation, symbol grouping, symbol use to represent quantities, and child engagement in learning. These aspects are interrelated, but not entirely identical. Children may recognize the shape of a number without understanding the quantity it represents, or they may be able to match symbols with teacher assistance but not yet use them independently.

Educational number games have the potential to provide learning experiences that connect symbols with concrete objects (Kusnaeni et al., 2023). The use of visual and manipulative media allows children to observe the shape of numbers, move objects, match symbols, and obtain feedback during the activity (Fatimah et al., 2023). The teacher's role remains crucial in adapting activities to children's abilities, asking questions that encourage children to think, and observing each child's development individually.

The findings reported in this article provide a preliminary overview of the use of educational number games to support some aspects of symbolic thinking in 5–6-year-old children. However, because the study used a qualitative approach, conclusions should be directed toward understanding the stimulation process and the children's responses, rather than claiming causal effectiveness or statistically significant improvements without adequate measurement data.

To strengthen scientific contributions, future research could further examine the types of games most appropriate for each indicator of symbolic thinking, the types of teacher support children require, and variations in responses based on each child's individual needs and abilities. Thus, educational number games can be understood not simply as a means of introducing numbers, but as part of a purposeful learning strategy designed to support the cognitive development of early childhood.

CONCLUSION

Symbolic thinking skills are a crucial aspect of early childhood cognitive development that require optimal stimulation. Research shows that educational number games are effective in enhancing these skills through symbol recognition, understanding number concepts, classification, symbolic representation, and increasing learning interest.

The use of educational games in early childhood education is highly recommended because it can create a fun and meaningful learning experience. This research is expected to serve as a reference for educators in developing innovative learning strategies.

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