

Stimulation of Children's Cognitive Abilities Through Educational Games Based on Problem Solving Activities

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Abstract

Cognitive development in early childhood is a crucial aspect that must be stimulated from an early age to help children think critically, logically, and adaptively in facing various challenges. One effective method to enhance cognitive abilities is through educational games based on problem-solving activities. Hasan and Husein stated that educational and traditional games can improve children's abilities in strategic thinking, decision-making, and problem-solving. This study aims to explore the role of educational games in stimulating the cognitive development of early childhood learners at PAUD Ummul Habibah. The research used a qualitative approach with observation and interview techniques. The results show that games such as puzzles, number boards, letter boards, and building blocks can improve concentration, symbol recognition, and logical thinking skills. Educational games based on problem-solving activities can be an enjoyable and effective approach in early childhood learning.

Keywords: Problem Solving, Cognitive Development, Early Childhood, Educational Games.

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Introduction

Early childhood cognitive development is one of the fundamental aspects that must be considered in education, because it is in this phase that children experience an initial thinking process that will be the basis for the next stage of development. According to Diamond (2020), cognitive development in early childhood is very important because 90% of brain development occurs in the first five years of life, where executive abilities such as inhibition control, working memory, and cognitive flexibility begin to take shape. Doebl (2020) explains that cognitive includes complex thinking abilities that involve high-level mental processes, including the ability to process multisensory information, integrate experiences, and develop flexible mental representations of the logic and perspectives of others. Therefore, stimulation in the form of problem-solving activities is important to help children develop logical thinking skills and understand more complex concepts.

Early childhood cognitive development is one of the fundamental aspects in forming critical thinking skills and solving problems independently. According to Miller (2020), this development is influenced by increased working memory capacity, attention efficiency, and decision-making ability, all of which play a role in actively processing information. Children learn to understand their environment through direct involvement in activities that demand exploration, observation, and reasoning. Therefore, learning strategies designed to stimulate children's thinking processes such as problem-solving-based activities can be an effective approach in developing cognitive function from an early age. PAUD Ummul Habibah is one of the early childhood education institutions located in Gg. Sedayu, Klambir V Kebun Village, Hamparan Perak District, Deli Serdang Regency, North Sumatra Province. The location is in the middle of residential areas. This PAUD has a total of 35 students and has been accredited with the predicate B.

Based on the results of interviews, observations, and documentation conducted at PAUD Ummul Habibah, it is known that there are still many children who do not know letters and numbers well. This has an impact on children's lack of concentration in the learning process, as well as low ability in writing and reading. In addition, during learning activities, some children seem to have difficulty understanding the instructions or explanations delivered by the teacher.

Seeing these problems, researchers applied several educational games that aimed to hone and train children's cognitive abilities, especially in recognizing letters, numbers, reading, and writing. This approach is expected to be a fun and effective solution in improving the learning ability of children at PAUD Ummul Habibah Klambir V Kebun, Hamparan Perak District.

Some of the types of educational games used in this study include puzzle games, letter boards, number boards, and stacking blocks. Puzzle games are given to children with the aim of practicing hand coordination and improving concentration. Children are asked to arrange the pieces of pictures to form a complete picture. This activity demands precision and focus, because without good concentration, the images will not be perfectly composed. Furthermore, the letter board is used to help children recognize the shape of the letter as well as practice the initial ability to write simple words. With this game, children begin to recognize letters and slowly develop their literacy skills.

Another game is a number board, which aims to introduce children to the shape and order of numbers. In addition to learning to write numbers, children are also introduced to the concept of counting in stages and structures. The stacking block game focuses on developing fine motor skills and hand coordination. This activity of arranging blocks not only encourages children's creativity, but also builds emotional satisfaction when children manage to arrange blocks into shapes according to their imagination.

Table 1. Results of the Game That the Researcher Applied to 10 Children at Paud Ummul Habibah Klambir V Kebun, Hamparan Perak District

Yes	Child's Name	Activities	Cognitive Abilities	Remarks
			What Observed	
1	Nayla	Stacking blocks 1-10	Getting to Know the Sequence numbers, logical thinking	Self-Finishing
2	Rafa	Box shape puzzle	Matching shapes and color	Need help Teacher
3	Arsya	Game Stacking Block Numbers 1120	Arrange the number beams in the order of the numbers	Active and focused
4	Andin	Putting together a puzzle	Recombine puzzle shapes	Need help from friends and teachers
5	Arya	Game Arrange the shape of the color block	Arrange the color blocks into the desired shape	Self-Finishing
6	Alea	Compiling a picture of a love shape puzzle	Reconstructing the shape of the love puzzle	Self-Finishing
7	Aaron	Letter Block Jumping Game	Jump over alphabetical letter blocks	Self-Finishing
8	Elisha	Letter game arranging Fruit words	Arrange the word fruit as desired	Self-Finishing
9	Zura	Number game: summation 110	Summing Up Results	Need help from teachers
10	Hafiz	Game Forming Train With Blocks	Stacking the beams into the shape of a train	Self-Finishing

The table above shows the results of observations of children who participated in educational game activities. Each child exhibits different cognitive abilities depending on the type of game being played. Nayla, for example, seems to be able to construct blocks of numbers independently and shows the ability to recognize the sequence of numbers and think logically. Meanwhile, Rafa still needs the teacher's assistance when playing puzzles, but he is starting to be able to match shapes and colors. Arsyia, showed a good memory of the numbers 1-10 through the game of number pairs, and looked active and focused during the activity, Andin was able to arrange the number blocks 11-1-20 properly and correctly without the help of friends or teachers, Arya arranged the shape of the color blocks well according to her wishes and was able to solve them herself without anyone's help, Alea seemed to compile the puzzle independently without anyone's help, Aaron jumped the letter blocks in a good order and correctly completed without anyone's help, Elisa composed some fruit words and finished independently, Zura played summing and determining the results and still needed the teacher's help, Hafiz formed a train using blocks and did it independently completed well and correctly.

These findings show that educational games are able to stimulate children's cognitive aspects in a variety of ways according to their individual characteristics and needs.

Literature Review

Early childhood cognitive abilities can be optimally developed through structured play activities, such as playing in a circle. This activity has been proven to be able to improve memory, hearing, imitation, and problem-solving skills. The results showed that the approach was able to increase the percentage of cognitive development from 51.07% to 84.82% in two learning cycles. This indicates that games that are fun and contain learning elements can be an effective strategy in stimulating children's thinking skills as a whole (Pahrul & Amalia, 2021). Everything around humans, uses their intellect (cognitive) to think about something. Therefore, when children are able to use their thinking concepts, the task of education is to develop them (Whildan, 2021). In the aspect of cognitive development, the expected result in children is to have the ability to think logically, critical thinking can provide reasons to be able to solve problems and find causal relationships in solving the problems faced (Novitasari & Prastyo, 2020).

Children's cognitive development is a fundamental aspect of early childhood education, because it includes the ability to think, understand, remember, and solve problems. One effective approach to stimulate this aspect is through educational games that are specifically designed to involve problem-solving activities.

According to Hasan and Husein (2024), traditional games have great potential as a means of stimulating problem-solving skills in early childhood, especially in the context of education in Indonesia. Games such as congklak, gobak sodor, and dakon not only provide entertainment, but also train children to think strategically, make decisions quickly, and interact socially in dynamic situations. This game requires children to understand the rules, recognize patterns, and adjust actions based on responses from playmates. This kind of activity can indirectly develop logical and adaptive thinking skills. Therefore, traditional play-based learning approaches are feasible to be applied in early childhood education as an effective, contextual, and culturally appropriate strategy.

According to Asmidar Parapat (2021), the use of educational games is most effective when activities are carried out based on the development goals to be achieved. These aspects include the development of cognitive talents, creative abilities, linguistic skills, physical-motor skills, early numeracy skills, and literacy skills. Other elements include the development of physical-motor skills.

According to Munisa, Parapat, Nofianti, and Pratiwi (2023), storytelling activities not only play a role in improving children's language skills, but also have a significant influence on their cognitive development. Through interactive storytelling activities, children are directly involved in the storyline, so that this process can stimulate imagination, train logical thinking

skills, and foster creativity and critical thinking. In addition, children also learn to remember, understand the content of the story, and re-express their ideas in a structured manner, which shows a stimulation of intellectual and reasoning functions. Thus, storytelling is an effective means to strengthen thinking skills, memory, and problem solving in early childhood.

According to Widya, Rozana, Ependi, and Yanti (2025), the use of loose parts media has great potential as a stimulation of cognitive development and early childhood literacy because it allows children to explore, manipulate, and connect the concepts of letters and words directly. The results of their study showed that loose parts-based learning was able to significantly improve reading, writing, and phonological awareness, with an increase in literacy scores of 73.8% in the experimental group compared to 34.2% in the conventional method. Open and flexible play activities make children more active, creative, and enthusiastic, so that the learning process becomes more interactive and meaningful. These findings confirm that the provision of loose parts media in early childhood education can support constructivism theories that emphasize the importance of children's direct involvement in building their cognitive understanding.

According to Lubis, Parapat, and Tumiran (2022), educational games are an effective means of learning to stimulate early childhood cognitive development. Through play activities, children get a fun learning experience while practicing logical thinking skills, solving problems, and improving concentration. Games such as puzzles, number boards, letter boards, legos, and stacking blocks have been proven to help children recognize symbols, hone memory, and develop motor coordination. By choosing games that are appropriate for developmental stages, the learning process becomes more interesting and can optimize children's cognitive, social, and emotional aspects.

According to Cynthia and Munisa (2025), the use of digital platforms such as YouTube and TikTok has a real influence on early childhood cognitive development. Unsupervised use can lead to decreased concentration ability, impaired memory, and weak language skills due to excessive and passive exposure to content. Children who watch too often tend to show imitative behavior, instant thinking, and difficulty focusing in learning activities. However, with assistance and direction from parents, these media can also increase children's creativity, curiosity, and ability to understand language and think logically. This shows that the influence of digital media on children's cognitive development is two-sided, depending on how the role of parents in directing and limiting their use.

Problem Solving and Cognitive Stimulation

Cognitive stimulation is a process designed to stimulate brain activity through various mental activities aimed at improving cognitive functions such as memory, attention, and logical thinking skills. According to Taniguchi et al. (2025), the development of human thought is not only limited to conscious cognitive processes as described in dual-process theory (System 1 and System 2), but also involves layers of pre-cognitive processing (System 0) and symbolic collective intelligence (System 3). The Quad-Process Theory model shows that cognitive stimulation can include physical activity, intuition, reflection, and social interaction in a learning environment.

On the other hand, the application of cognitive stimulation has also proven to be beneficial in non-educational contexts. Fatima et al. (2025) in their study showed that interventions such as digital game therapy, reality-oriented exercises, and the use of virtual reality can reduce the risk of cognitive function impairment in elderly patients in hospitals. Despite the medical context, the study confirms that thought-stimulating activities can have a significant impact on attention, working memory, and executive function, which is also relevant for early childhood.

The importance of adapting cognitive stimulation strategies to cultural contexts was also emphasized by Yohana et al. (2024) through a study of the implementation of Cognitive Stimulation Therapy (CST) in Tanzania. Adaptation of cognitive therapy programs to local conditions successfully increases its effectiveness on memory, language, and thinking

flexibility. These findings strengthen the relevance of culture-based approaches in designing learning activities that are able to stimulate children's thinking skills optimally.

Problem-solving skills are an important part of a child's cognitive development, which includes the ability to identify problems, look for alternative solutions, evaluate options, and make decisions. According to Gültepe et al. (2025), the success of individuals in solving problems is not only determined by logical intelligence, but is also influenced by the emotional state and form of stimulation received. In his research, it was found that a positive mood combined with cognitive stimulation can increase the fluency of ideas, while a negative mood without much external stimulation actually produces more original ideas. Therefore, the approach to developing problem solving must consider the emotional and environmental dimensions.

In the context of early childhood education in Indonesia, Hasan and Husein (2024) highlight the role of traditional games such as congklak, gobak sodor, and dakon as a means of effective problem solving stimulation. This game requires children to think strategically, make decisions, and actively interact socially. These activities can strengthen children's logical and adaptive thinking skills in a fun and contextual way with the local culture. Therefore, traditional play-based approaches deserve to be integrated into the early childhood education curriculum to stimulate cognitive development holistically.

Research Methodology

This research uses a qualitative approach that aims to understand social phenomena and human behavior through a comprehensive and in-depth description delivered narratively. This approach allows researchers to capture the informant's subjective view in a natural context (Walidin, Saifullah, & Tabrani, 2015:77). The subject of the study is early childhood (5-6 years) who is in PAUD Ummul Habibah Klambir V Kebun, Hamparan Perak District.

This study uses observation and interview techniques as the main data collection method. Observation was made directly on children's play activities in the classroom, especially when participating in educational games designed to stimulate cognitive abilities. Aspects observed include attention, concentration, the child's response to instructions, as well as the ability to complete tasks in the game. In addition to being carried out by researchers, observation was also assisted by one of the classroom teachers, namely Khairunisah, S.Pd, who acted as a companion observer to ensure that the data obtained reflected real conditions in the field.

Interviews were conducted with educators at PAUD Ummul Habibah, namely Khairunisah, S.Pd, Bella Novi Syahputri, S.Pd, and Larasati Purdiasih, A.Md, in order to obtain in-depth information about children's cognitive development, obstacles faced during learning, and the effectiveness of educational games applied. The subjects in this study are 10 early childhood education students of Ummul Habibah. The data obtained from observations and interviews were then analyzed in a qualitative descriptive manner to describe the tendency and changes in children's cognitive behavior based on the observed indicators.

Results

Based on the results of observations and interviews with PAUD teacher Ummul Habibah, the application of educational games such as puzzles, number boards, letter boards, and stacking blocks showed diverse cognitive development in the ten children participating in the activity. The data showed that Nayla was able to arrange blocks of numbers 1–10 independently and knew the sequence of numbers well. Rafa plays a square-shaped puzzle and can match shapes and colors, although he still needs the help of a teacher. Arsyia is active and focused when arranging blocks 11–20 in order. Andin put together the puzzle until it returned to its original form with a little help from friends and teachers. Arya succeeded in arranging the color blocks into the desired shape independently. Alea is able to put together heart-shaped puzzles without help. Aaron completed the game of jumping over alphabetical block letters. Elisha arranged the

word fruit using a letter board independently. Zura played numbers with the sum of 1–10, but still needed the guidance of the teacher. Hafiz arranged the beams into the shape of a train independently and neatly.

Overall, this play activity shows improved cognitive abilities such as number and letter recognition, concentration, fine motor coordination, and problem-solving skills. Children who are initially hesitant become more courageous to try, more patiently wait for their turns, and understand instructions more quickly after several encounters. The teacher also noted that there was a development in the child's ability to complete the game with better independence than before the activity started. These findings show that educational games based on problemsolving activities can be an effective means to stimulate logical thinking skills and early literacy according to the child's developmental stage.

Discussion

The results of the study show that the application of educational games in the form of puzzles, number boards, letter boards, and stacking blocks can make a positive contribution to improving children's cognitive abilities in PAUD Ummul Habibah. Children appear more focused, able to recognize the sequence of numbers, compose simple words, and show better memory. Field data showed that Nayla was able to construct blocks of numbers 1–10 independently, reflecting the development of concentration and a logical mindset. Meanwhile, Rafa and Zura still need teacher assistance, but have shown progress in recognizing shapes and doing basic summation.

These findings support the statement of Naldi (2018) that children's cognitive development is greatly influenced by environmental stimuli, especially through play activities that provide opportunities for children to use their thinking skills. The activity of compiling puzzles and blocks involves the process of solving problems and understanding the cause-and-effect relationship. This is in line with the opinion of Novitasari & Prastyo (2020) who explain that cognitive development is characterized by the ability to think logically, give reasons, and solve problems independently.

In addition, the application of educational games is in line with the views of Hasan & Husein (2024) who emphasize that traditional and educational games can train children to think strategically, make decisions quickly, and adjust actions according to the situation. Activities such as arranging numbers or letters require children to recognize patterns and adjust steps gradually, so as to indirectly foster problem-solving skills and adaptability.

The results of this study also reinforce the findings of Pahrul & Amalia (2021) which show that play activities designed in a structured manner can improve memory, listening skills, and problem-solving skills. The increased concentration and independence observed in children during the study proved that educational games were able to stimulate overall cognitive development. Furthermore, research by Widya et al. (2025) on the use of loose parts media also confirms that flexible play activities can foster children's creativity and literacy, in line with the observation that children are more enthusiastic and active when given the freedom to explore games.

Thus, educational games based on problem-solving activities have proven to be a fun learning strategy as well as relevant to the context of early childhood learning. This activity not only helps children recognize letters and numbers, but also improves concentration, memory, and logical thinking skills according to the indicators of cognitive development that have been described in the theoretical study.

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