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## Implementation of Center-Based Games to Improve Early Childhood Cognitive Abilities

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### ABSTRACT

This study aims to determine the effectiveness of implementing center-based games in improving the cognitive abilities of early childhood. This study used the Classroom Action Research (CAR) method with the Kemmis & McTaggart model which was implemented in two cycles. The subjects were 15 children in group aged 5-6 years in one of the PAUD in Mamuju City. Data collection techniques were carried out through observation, interviews, documentation, and simple cognitive tests. The results showed that the implementation of center-based games, such as block centers, natural materials, art, and role-playing, was able to improve children's cognitive abilities. There was an increase in the average cognitive achievement of children from 65% in cycle I to 85% in cycle II. In addition, children demonstrated better logical thinking, problem-solving, and understanding of basic mathematical concepts. This study concluded that center-based games are effective in optimizing the cognitive development of early childhood.

### INTRODUCTION

Cognitive development in early childhood plays a crucial role because this period is known as the golden age, which lays the foundation for a child's future intellectual development. During this period, a child's brain experiences rapid growth, so appropriate stimulation is essential to optimize the ability to think, understand, and adapt to the environment. The ability to think logically, solve problems, and recognize basic concepts such as numbers, colors, shapes, and patterns needs to be developed early on through various educational activities and games that stimulate children's thinking. If cognitive development is properly facilitated at this age, children will be better prepared to face the next stages of their education and be able to adapt to the challenges of life in the future (Ayuni et al., 2022).

The role of play in early childhood education is vital because it is a primary, natural, and enjoyable activity for children to learn and develop. Play is not simply a pastime, but an effective way for children to explore the world around them, recognize objects, and understand cause-and-effect relationships through direct experience. Through various forms of play, children can develop motor, cognitive, language, social, and emotional skills in a balanced manner. Interaction with peers during play also fosters the ability to cooperate, share, and resolve simple conflicts (Damayanti, 2025). Furthermore, play provides space for children to imagine and create, which ultimately encourages the development of creativity and critical thinking skills. Therefore,

learning approaches in early childhood education should be designed to integrate various directed and educational play activities to make the learning process more effective and enjoyable (Gea & Zega, 2025).

The center-based game concept is a learning approach designed to provide a comprehensive learning experience through various specific activity areas or centers (Wilis Werdiningsih, 2022). In this method, children are guided to actively learn in various centers, such as a block center to practice construction skills and logical thinking, a natural materials center to explore the environment and foster curiosity, an art center to develop creativity and self-expression, and a role-playing center to help children understand various social roles in society. Each center is designed with the aim of stimulating various aspects of children's development, including cognitive, motor, social-emotional, and language. Through varied and contextual activities in each center, children not only gain new knowledge but also hone their critical thinking, problem-solving, and peer collaboration skills. This approach is important in early childhood education because it gives children the freedom to learn according to their interests while still receiving optimal stimulation in various aspects of development (Solihin, 2024).

A common problem encountered in various Early Childhood Education (PAUD) institutions is the continued dominance of conventional learning methods, which tend to focus on a one-way approach and memorization. This method lacks active, exploratory, and enjoyable play for children, making learning less relevant to the characteristics and developmental needs of early childhood (Maulana & Eliasa, 2024). In fact, children at this age should receive stimulation through direct experiences, social interactions, and activities that allow them to experiment and solve problems independently. The lack of implementation of a playful approach in the learning process results in the suboptimal development of children's cognitive abilities, including logical thinking, creativity, and understanding of basic concepts. This situation highlights the importance of changing teaching methods in early childhood education institutions by integrating more play-based learning strategies to support children's holistic growth and development (Sifa Ulfadilah et al., 2023).

The urgency of this research lies in the need to present innovations in learning methods that are not only effective, but also fun and appropriate to the developmental stages of early childhood (Wismanto et al., 2024). Given the highly active, curious, and playful nature of children during the golden age, monotonous and conventional learning methods are no longer relevant to accommodate these needs. Therefore, an approach is needed that can stimulate children's cognitive development through hands-on, interactive, and exploratory experiences (Arisanti et al., 2024). One alternative believed to be effective is the implementation of center-based games, where children can learn through various activity centers specifically designed to develop various aspects of their abilities, including cognitive aspects. Therefore, this research is important to further examine the effectiveness of center-based games in improving logical thinking, problem-solving, and understanding basic concepts in early childhood (Burns et al., 2025).

Research related to center-based games generally still focuses on the development of children's social-emotional or motor aspects, while studies that specifically highlight the improvement of cognitive abilities such as logical thinking, problem solving, and understanding number concepts are still limited (Tamblyn et al., 2023). In many early childhood education institutions, the implementation of center-

based play is often not systematically and planned to support the goal of improving children's cognitive development, compounded by limited guidance for teachers on integrating cognitive stimulation into each type of center. Furthermore, there is still little research using the Classroom Action Research (CAR) model to evaluate and continuously improve the implementation of centers in an effort to improve the cognitive aspects of early childhood. The measurement instruments used in some studies also tend to be general and not directly linked to concrete activities in each play center, making them less able to measure children's cognitive development specifically. Furthermore, existing research has not explored the local context that influences children's play patterns and learning processes, even though each region has unique social and cultural characteristics that can influence the effectiveness of center-based play in improving children's cognitive abilities in certain early childhood education environments (Kinkead-Clark, 2019).

The purpose of this study is to determine and analyze how the implementation of center-based games can improve the cognitive abilities of early childhood in a directed, systematic, and sustainable manner. This study aims to describe the process of planning, implementation, and evaluation of the application of game centers in learning in early childhood education institutions, as well as to see the extent of the contribution of each type of center to the development of children's cognitive aspects, such as the ability to think logically, solve problems, understand the concept of numbers, and recognize cause-and-effect relationships. In addition, this study also attempts to develop an applicable learning model for early childhood education teachers if they are able to integrate cognitive stimulation in various play activities effectively and in accordance with the child's developmental stage.

## METHODOLOGY

This research uses the Classroom Action Research (CAR) method with the Kemmis and McTaggart model which consists of four stages, namely planning, implementing actions, observation, and reflection (Prihantoro & Hidayat, 2019). The approach used is a combination of qualitative and quantitative to obtain a comprehensive picture of the process and results of improving cognitive abilities in early childhood. The subjects of this study were 15 children in Group B aged 5-6 years old at a PAUD in Mamuju City. This study was conducted in two cycles, where each cycle included several meetings with the implementation of center-based games, such as block centers, natural materials centers, and role-play centers. Data collection techniques in this study included observation, interviews, documentation, and simple cognitive tests (Mehrad et al., 2024). Observations were conducted to assess children's engagement and cognitive abilities during play at the center. Interviews were conducted with teachers to obtain information on the effectiveness of the center's implementation in learning. Documentation in the form of photos, videos, and diaries was collected as supporting data. Additionally, simple cognitive tests were administered to measure logical thinking, problem-solving, and basic mathematical concepts.

The instruments used were observation sheets for children's cognitive development, interview guides for teachers, and instruments for evaluating children's cognitive abilities. The collected data were analyzed using qualitative analysis techniques through data reduction, data presentation, and drawing conclusions, as well as simple quantitative analysis by calculating the percentage increase in children's cognitive abilities from cycle I to cycle II. The research procedure was carried out

systematically by implementing center-based games in the first cycle, followed by reflection to evaluate the results and obstacles found. In the second cycle, improvements were made based on the results of the reflection to optimize the learning strategy, until the expected increase in cognitive abilities was achieved.

## RESULTS AND DISCUSSION

The results of the study showed a significant increase in the cognitive abilities of early childhood children from cycle I to cycle II after the implementation of center-based games. In cycle I, the average cognitive achievement of children was 65%, then increased to 85% in cycle II. This increase was seen in various cognitive aspects, such as the ability to think logically and systematically when arranging block patterns, number recognition and simple arithmetic skills through the natural materials center, and a faster understanding of the concepts of comparing size, color, and shape when playing in the art and natural materials center. In addition, children began to be able to solve simple problems through role-playing. This increase was inseparable from the more active and directed role of teachers in cycle II, by providing intensive guidance and using provocative questions to train children to think critically and find solutions. Children's enthusiasm and involvement also increased, indicated by a higher interest in participating in activities at each center and more consistent attendance throughout the learning process.

**Table 1. Development of Children's Cognitive Abilities per Cycle**

No	Rated aspect	Percentage of Cycle I	Cycle II Percentage	Improvement
1	Think logically	63%	85%	22%
2	Solution to problem	60%	84%	24%
3	Understanding the concept of numbers & counting	65%	86%	21%
4	Recognizing patterns, shapes & colors	67%	88%	21%
5	Creativity in playing	70%	90%	20%

*Source: Primary data from research results, 2025.*

This table shows the percentage of early childhood cognitive development in each assessed aspect, both in cycles I and II. Observed aspects include logical thinking, problem-solving, recognition of number and counting concepts, pattern, shape, and color recognition, and creativity in play. The data shows that each aspect experienced significant improvement after corrective actions were implemented in cycle II. For example, children's logical thinking skills increased from 63% to 85%, and problem-solving skills increased from 60% to 84%. These improvements indicate that center-

based play is effective in optimizing various aspects of children's cognitive development.

**Table 2. Average Percentage of Children's Cognitive Achievement**

Cycle	Average Percentage
Cycle I	65%
Cycle II	85%
Improvement	20%

*Source: Primary data from research results, 2025.*

This table shows the overall average percentage of children's cognitive achievement in each cycle. In cycle I, the average cognitive achievement was 65%, while in cycle II, it increased to 85%. There was an average increase of 20% after improvements to the learning strategy in the second cycle. This indicates significant improvement resulting from the more effective implementation of center-based games and more intensive teacher support.

**Table 3. Children's Presence and Participation During the Research**

No	Number of children	Average Attendance Cycle I	Average Attendance Cycle II	Information
1	15	87%	95%	Participation increases

*Source: Primary data from research results, 2025.*

This table provides information on the level of attendance and participation of children during the learning process in each cycle. In cycle I, the average attendance was 87%, while in cycle II, this increased to 95%. This increase in participation reflects the children's growing enthusiasm for center-based play activities. High participation contributes to the successful improvement of cognitive abilities because children are more frequently involved in exploration and learning activities through play.

#### **Center-Based Games Effectively Improve Cognitive Skills**

Center-based games have been proven to be effective in improving the cognitive abilities of early childhood because each center is designed to provide various forms of rich and varied stimulation according to the characteristics of child development (Musdalifa et al., 2025). Through varied activities in each center, children not only learn with a single approach but also gain multisensory experiences involving their senses of sight, hearing, touch, and even body movement. These hands-on experiences enable children to understand basic concepts more concretely and deeply, such as recognizing numbers, shapes, patterns, colors, and cause-and-effect relationships through exploration and manipulation of objects in their learning environment. For example, in the block center, children develop logical and spatial thinking skills through building activities; in the art center, they practice creativity and symbol recognition; while in the role-play center, children learn to solve problems in a



social context. The integration of these various stimuli strengthens children's cognitive understanding because it involves various mutually supportive learning pathways, making the thinking process more active, systematic, and meaningful (Cherukunnath & Singh, 2022).

### **The Role of Structured Play Environments**

A structured play environment arranged based on a central theme has an important role in creating a fun, meaningful and educational learning atmosphere for early childhood (Bautista et al., 2019). By arranging spaces and activities around specific themes, such as family, nature, transportation, or professions, children can learn in contexts close to their daily lives. This approach helps children connect new knowledge with their existing experiences, making the learning process easier to understand and accept. Furthermore, a structured environment allows children to focus because each center has a clear purpose, props, and activities, minimizing distractions and encouraging concentration on the task at hand. Through contextual, hands-on activities, children not only understand the material theoretically but also practice critical thinking, decision-making, and problem-solving skills naturally in a fun atmosphere. This makes the play environment a crucial element in supporting successful learning in early childhood education institutions (Putri & Hibana, 2024).

### **Teacher as Main Facilitator**

Teachers have a central role as the main facilitator in the center-based learning process, especially in efforts to stimulate the cognitive development of early childhood (Aulia, 2024). The success of cognitive stimulation depends heavily on the teacher's ability to actively guide children during activities in various play centers. Teachers serve not only as supervisors but also as companions, able to ask open-ended questions to stimulate children's thinking, encouraging them to think critically, seek solutions, and explore various possibilities. Furthermore, teachers play a crucial role in providing concrete examples that can help children grasp abstract concepts in a simple and easy-to-understand manner (Hibana et al., 2024). The teacher's ability to modify games is also crucial, namely by adjusting the activities and difficulty level of the game to suit the needs, interests, and developmental stage of each child. With this flexible and responsive approach, teachers can ensure that each child receives optimal cognitive stimulation appropriate to their developmental stage. The teacher's role as a creative and adaptive facilitator makes the learning process more dynamic, effective, and meaningful for the intellectual development of early childhood.

### **Obstacles and Solutions**

In the implementation of center-based games in PAUD institutions, one of the obstacles that often arises is the lack of understanding of children regarding the game instructions given by the teacher (Aziz et al., 2024). Early childhood children tend to require simple and concrete explanations, so relying solely on verbal instructions is often ineffective. To overcome this obstacle, teachers need to provide direct examples through demonstrations of how to play and the steps to be taken. Intensive guidance while children play is also necessary to ensure they understand the goal of the game and how to play it correctly (Linda et al., 2022). Furthermore, the variety of play equipment provided is also an important factor in supporting successful learning. Play equipment that is attractive, colorful, and tailored to children's interests can increase their motivation and participation in each activity. Providing a variety of play equipment also

helps stimulate various aspects of cognitive development because children can choose activities that match their abilities and interests. With a combination of optimal support and adequate play facilities, obstacles in the learning process can be minimized, so that the goal of improving children's cognitive abilities through center-based play can be effectively achieved (Kamal & Gabr, 2024).

#### Relation to Cognitive Development Theory

The results of this study are closely related to the theory of cognitive development put forward by experts, particularly Jean Piaget and Lev Vygotsky. Piaget emphasized that early childhood cognitive development occurs optimally through a process of active exploration of the surrounding environment. Children learn to understand the world through direct interaction with concrete objects and experiences, which then form new thought patterns and strengthen logical thinking skills. The implementation of center-based games that emphasize exploratory and manipulative activities aligns with Piaget's view, as children are encouraged to learn through real-life experiences, try various strategies, and find their own solutions (Kerslake, 2019).

Furthermore, the concept of play involving social interaction within each center aligns with Vygotsky's theory of the zone of proximal development (ZPD), where children's abilities develop better when they receive assistance or scaffolding from adults or more capable peers. In this context, the teacher acts as a facilitator, providing the guidance and support necessary to help children reach higher levels of understanding. Thus, the center-based play approach is not only effective in improving children's cognitive abilities but also reinforces the main principles of cognitive development theory put forward by these experts (McCartan et al., 2023).

#### CONCLUSION

Based on the research results, it can be concluded that center-based games are effective in improving the cognitive abilities of early childhood, particularly in the aspects of logical thinking, problem solving, and understanding basic mathematical concepts. There was a significant increase in children's cognitive abilities from cycle I to cycle II, both in terms of conceptual understanding, creativity, and critical thinking skills. Play activities designed in various centers can encourage children to learn through direct experience, exploration, and meaningful social interactions. In this case, the role of teachers is very important as facilitators, companions, and providers of cognitive stimulation through appropriate questions and directions. The play-based learning approach in centers not only creates a fun learning atmosphere but is also effective in developing children's cognitive aspects holistically. In addition, the use of varied and contextual play equipment in each center helps minimize boredom and increases children's motivation to continue learning and developing.

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