15 (2) (2026) 1395-1403

Journal of Physical Education, Sport, Health and Recreations

http://journal.unnes.ac.id/journals/peshr

Analysis of the Role of Educational Play Activities in Early Childhood Cognitive Development

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Keywords

Educational Play; Cognitive Development; Early Childhood

Abstract

This research aims to examine how educational play activities contribute to enhancing early childhood cognitive development. The cognitive aspect is a crucial part of child development as it relates to the ability to think, solve problems, and understand their surrounding environment. This study uses a qualitative approach through a literature review supported by simple observations of children's play activities. The findings indicate that various forms of educational play, such as puzzles, building blocks, and exploratory games, can stimulate thinking abilities, improve focus, and encourage the development of children's logic and creativity. Additionally, the active role of parents and teachers in accompanying children during play also significantly influences optimal cognitive development. Thus, educational play activities can serve as an effective and enjoyable learning medium for early childhood. Therefore, proper management and utilization of play activities are necessary for children's cognitive development to reach its maximum potential.

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p-ISSN 2460-724X
e-ISSN 2252-6773

INTRODUCTION

Early childhood is a phase of rapid growth and development, especially in the cognitive aspect. During this period, children begin to develop the ability to think, understand information, remember, and solve simple problems in daily life. Therefore, appropriate stimulation is required for optimal cognitive development. One effective form of stimulation is through educational play activities. Play is not merely an activity to pass the time but also an important learning tool for children. Through play, children can learn about their environment, express creativity, and hone their thinking skills. Various studies have shown a strong correlation between play activities and children's cognitive development, particularly in logical thinking and problem-solving abilities.

Furthermore, the use of educational games such as puzzles, building blocks, and exploratory games has been proven to enhance children's critical thinking and creativity (Alika K et al., 2025). This indicates that play plays a significant role in supporting the learning process in early childhood. Cognitive development in early childhood is a crucial factor influencing subsequent learning success. (Zuva et al., 2025) assert that children's cognitive capacities develop optimally when they are directly engaged in activities that are contextually relevant to their developmental world; in this regard, play is the learning modality that best aligns with the characteristics and developmental needs of young children.

Empirical evidence suggests that teacher-centered instructional approaches tend to position children as passive recipients of knowledge, with limited space for autonomous exploration and meaning-making (Lazar, 2025; Zuva et al., 2025). This aligns with constructivist theory, which states that children build their knowledge through interaction with their environment. (Hidayattullah et al., 2023)explain that, within the framework of Piaget's developmental theory, cognitive development during early childhood which encompasses physical, cognitive, social, and emotional dimensions proceeds gradually through the mechanisms of assimilation and accommodation, driven by children's active engagement in exploring their environment. This theoretical foundation provides a strong justification for the use of play as the primary pedagogical vehicle, through which young children constructively build basic knowledge schemas via meaningful direct experiences. Moreover, it is explained that educational play activities can enhance various cognitive aspects, such as critical thinking, problem-solving, concentration, and language development (Kumar, 2026; Sitorus et al., 2025). Children involved in educational play tend to show higher engagement in the learning process compared to conventional teaching methods (Kohli, 2025; Sakib, 2022).

(Cheruiyot, 2024) found that the implementation of a play-based learning approach has a significant impact on improving early literacy skills in young children. These findings indicate that the contribution of play activities is not limited solely to the cognitive domain but also encompasses a more comprehensive dimension of development, including language skills and communication abilities. This reinforces the argument that play-based learning is a holistic and integrative pedagogical strategy, capable of facilitating the multidimensional development of young children through a single, integrated learning approach.

However, the implementation of play-based learning still faces several challenges, such as teachers' limited understanding of the concept of educational play, scarcity of learning media, and demands to achieve academic targets from an early age. This condition often makes learning more focused on results rather than the process. Therefore, a deeper understanding of the importance of play-based learning in supporting early childhood cognitive development is needed. By integrating play activities into the learning process, children are expected to learn more effectively, enjoyably, and in accordance with their developmental stage, as emphasized in the journal (Zuva et al., 2025).

A number of previous studies have consistently shown that educational games such as puzzles, constructive play, and role-playing contribute to the development of logical thinking, problem-solving, language, and social-emotional skills in young children. These studies also confirm that a play-based learning approach has proven to be more effective than teacher-centered learning in enhancing the engagement of early childhood learners (Alika K et al., 2025; Lazar, 2025; Sitorus et al., 2025; Zuva et al., 2025). However, one aspect that has not been extensively studied is how these various categories of play work synergistically rather than in isolation to stimulate children's cognitive development, as well as the extent to which these

findings align with children's play behaviors observed directly in natural settings. Most previous studies have tended to focus on a single type of play or rely solely on desk reviews, resulting in a gap in the development of an integrated explanation one grounded in literature reviews and reinforced by empirical observational evidence.

Efforts to bridge this gap are significant both theoretically and practically. Theoretically, an integrated explanation can enrich the perspectives of constructivism and Piaget's theory of cognitive development by clarifying how various types of play collectively support the processes of assimilation and accommodation in early childhood. Practically, this understanding can serve as a guide for teachers and parents in selecting and combining play activities in a more purposeful way, so that educational games can be designed with clear developmental goals, rather than merely serving as a way to pass the time.

The novelty of this study lies in its effort to synthesize findings from various categories of educational play—namely, constructive play, traditional play, role-playing, and social play—into a single conceptual framework grounded in a literature review, which was then confirmed through simple field observations of children's play behavior. Thus, this study expands the scope of previous research which tended to focus on a single aspect of play in isolation by offering a more holistic and integrated view of how various play activities collectively contribute to the cognitive development of young children.

METHODS

This research adopted a qualitative approach, which focuses on an in-depth understanding of phenomena through the interpretation of meaning, rather than relying on numerical data or statistical calculations. This approach was chosen because it is considered capable of providing a more comprehensive picture of the role of educational play activities in supporting children's cognitive development. The method used is a literature review, a research method that primarily uses various written sources for data collection. Through literature review, researchers can analyze, compare, and integrate various theories, concepts, and previous research findings relevant to the study topic.

The data for this study were sourced from various reliable scientific references, such as national and international journals, academic books, and scientific articles related to educational play activities and early childhood cognitive development. The selection of sources was done carefully, considering their relevance, accuracy, and recency of information, ensuring that the data used genuinely support the analysis process.

Data collection was carried out in two ways: literature review and simple observation. The literature review involved reading and analyzing various sources to obtain a strong theoretical foundation. In addition, the researchers conducted simple observations of children's play activities as supporting data. These observations were carried out directly in children's natural environments without special intervention, so the observed behaviors reflected actual conditions. In this case, the researchers acted as non-participant observers, without directly engaging in the activities.

The collected data were then analyzed using qualitative descriptive techniques. The analysis process involved grouping data, organizing information based on certain themes, and interpreting the meaning contained within. The researchers then linked findings from observations with relevant theories to gain a deeper understanding of the role of educational play activities in stimulating children's cognitive development. The results of the analysis are presented in a systematic narrative to be easily understood and to provide a clear picture of the phenomenon studied.

RESULTS AND DISCUSSION

Based on the review of various relevant journals and research, it can be concluded that educational play activities contribute significantly to supporting early childhood cognitive development (Sitorus et al., 2025; Yuliana & Tufail, 2025). Play is no longer merely understood as a leisure activity but rather as an effective and meaningful learning process for children. Through play activities, children are actively involved in exploring their environment, discovering new

things, and solving various simple problems, which ultimately stimulates their thinking abilities (Kumar, 2026)

The study findings indicate that various forms of educational play, such as puzzles, role-playing, and constructive play, provide different but complementary cognitive stimuli. Puzzle games, for example, can help children develop logical thinking skills, recognize patterns, and train problem-solving abilities (Damayanti et al., 2022; Alika K et al., 2025). Furthermore, these activities also have an impact on improving children's focus, perseverance, and self-confidence in completing tasks.

On the other hand, other research reveals that role-playing and socio-cognitive games play a role in developing children's language skills and mathematical abilities (Lazar, 2025). Interactions during play encourage children to communicate, understand concepts, and develop more complex thinking patterns. This shows that play does not only impact one aspect of development but also influences children's overall abilities.

1. Mechanisms of Educational Play Activities in Stimulating Early Childhood Cognitive Processes

Educational play activities play a role in stimulating early childhood cognitive development through a gradual process involving various aspects, such as mental, social, and emotional. This stage begins with exploratory activities, where children actively interact with their environment and play tools. In this process, children use their five senses to recognize shapes, colors, sizes, and patterns of objects they encounter. For instance, when playing puzzles, children train their visual observation skills, focus, and memory (Alika K et al., 2025). This exploratory stage is crucial for developing more complex thinking abilities.

After gaining initial experiences, children begin to process the information they obtain through reasoning. They try to understand the relationships between objects by comparing, grouping, and matching. Games like puzzles, LEGOs, or constructive play encourage children to think logically and systematically in solving challenges. From these activities, children learn to recognize patterns, arrange steps, and understand cause-and-effect relationships. This shows that play activities do not only involve physical movements but also active and deep thinking processes. Research also indicates that constructive and socio-cognitive play can enhance children's logical thinking and basic mathematical abilities (Damayanti et al., 2022; Lazar, 2025).

Furthermore, the trial-and-error process is an important part of educational play. When faced with difficulties, children will try various ways until they find the right solution. This process helps children develop problem-solving skills, flexible thinking, and decision-making based on their own experiences. In play-based learning, activities such as assembling puzzles or building blocks are proven to enhance children's creativity and problem-solving abilities (Alika K et al., 2025; Sakib, 2022)

Social interaction also contributes significantly to children's cognitive development. When playing with friends or with guidance from a teacher, children learn to communicate, exchange opinions, and work together. Activities like role-playing allow children to develop imagination, language, and symbolic thinking skills. Through these interactions, children's understanding becomes broader as they learn not only from their own experiences but also from others.

The experiences gained during play are then processed into new knowledge through internalization. Children begin to build concepts based on their direct experiences. In this way, learning becomes more meaningful and easily remembered in the long term. The play-based learning approach supports this process by providing children with opportunities to learn actively and in accordance with their developmental stage (Zuva et al., 2025).

On the other hand, a fun play environment also has a positive emotional impact. Children feel happy, motivated, and more confident in participating in activities. This condition makes them more focused and persistent in completing tasks. Research shows that games like puzzles not only improve thinking skills but also train children's concentration and perseverance. (Alika K et al., 2025)

Overall, the mechanism of educational play in stimulating children's cognition occurs through interconnected stages, starting from exploration, reasoning, problem-solving, social interaction, to concept formation, reinforced by positive emotions. This shows that play is a natural, enjoyable, and effective way of learning to develop children's thinking skills in depth.

2. Effectiveness of Play-Based Learning Approach Compared to Conventional Learning

The play-based learning approach is considered more effective than conventional learning in developing early childhood cognitive abilities because it aligns with children's active, curious, and exploratory learning characteristics (Kohli, 2025; Kumar, 2026). Through play activities, children are directly involved in the learning process without feeling burdened. The enjoyable atmosphere makes children more enthusiastic, focused, and easily understand the material provided. Unlike conventional methods, which tend to be teacher-centered and one-way, this approach provides space for children to play an active role in learning activities (Lazar, 2025; Zuva et al., 2025)

Furthermore, play-based learning provides opportunities for children to hone their thinking skills through real experiences. In various educational games such as puzzles or constructive play, children are trained to think logically, recognize patterns, and devise strategies to achieve goals. This process helps improve critical thinking and problem-solving skills. Meanwhile, conventional learning tends to emphasize memorization, thus less encouraging the development of deeper thinking skills.

Another advantage lies in the process of trial and error. Children are given the freedom to try various ways to solve a task until they find the right solution. This helps develop flexible thinking and decision-making skills. Research also shows that well-designed play activities can increase children's creativity and problem-solving abilities compared to rigid teaching methods (Sakib, 2022).

This approach also strengthens cognitive development through social interaction. When playing together, children learn to communicate, exchange ideas, and understand other people's perspectives. Activities like role-playing can help develop language skills and symbolic thinking, which are very important in cognitive development. In conventional learning, opportunities for such interactions are usually more limited.

From an emotional perspective, the enjoyable learning atmosphere in play-based learning makes children feel comfortable and confident. This condition impacts increasing children's concentration and perseverance in completing tasks. Games like puzzles not only train thinking skills but also help children develop focus and persistence in learning (Alika K et al., 2025). Conversely, monotonous learning often makes children quickly bored and less motivated.

In summary, play-based learning is superior because it integrates active involvement, direct experience, thinking skills, social interaction, and emotional support into a single learning process. This approach makes learning activities more meaningful and appropriate to the child's developmental stage, thus allowing cognitive development to proceed optimally.

3. Different Contributions of Various Types of Games to Cognitive Development

The different contributions of various types of games to early childhood cognitive development can be seen from how each game stimulates children's thinking abilities. Based on a review of several journals, each type of educational game has a different role in developing certain cognitive aspects (Sitorus et al., 2025; Yuliana & Tufail, 2025). Nevertheless, all these types of games are complementary and together support holistic cognitive development.

Constructive games like puzzles and LEGOs tend to contribute strongly to logical and analytical thinking skills. In these activities, children are challenged to arrange, match, and understand the relationships between parts. This process encourages children to think systematically, recognize patterns, and devise strategies to complete tasks. In addition, games like puzzles also help improve children's concentration, meticulousness, and memory (Alika K et al., 2025). Thus, constructive games are very important in developing problem-solving and critical thinking skills.

On the other hand, traditional games like congklak (mancala) offer different learning experiences. This game emphasizes counting abilities, step planning, and simple decision-making. Children are trained to count seeds, estimate subsequent moves, and predict possible outcomes of their actions. This process indirectly helps children understand basic mathematical concepts in an enjoyable way. This shows that traditional games also have high educational value in developing cognitive abilities, especially in numerical and strategic aspects.

Meanwhile, role-playing games contribute more dominantly to the development of symbolic thinking, language, and imagination. In these games, children act as certain characters and create situations that resemble real life. Through these activities, children learn to use symbols, develop stories, and express their ideas and feelings. Furthermore, role-playing also helps children understand social concepts and train communication skills. Thus, these games are important in enriching children's thinking and enhancing their creativity.

Besides these three types of games, social games involving interaction with peers also make a significant contribution. In group games, children learn to cooperate, discuss, and exchange opinions. They also learn to resolve conflicts and understand other people's perspectives. This interaction encourages children to think more broadly and critically, as they do not only rely on their own thoughts but also consider others' ideas. Therefore, social games play a significant role in developing reflective thinking and cognitive skills related to social interaction.

Overall, each type of game has a different contribution to children's cognitive development. Constructive games focus on developing logic and problem-solving, traditional games strengthen counting and strategy skills, role-playing games develop imagination and language, while social games enhance thinking skills through interaction. This difference actually becomes a strength, because by combining various types of games, children's cognitive development can be stimulated more optimally and comprehensively.

4. Inhibiting Factors in the Implementation of Play-Based Learning

Obstacles in implementing play-based learning for early childhood cognitive development can arise from various sides, including factors related to educators, the learning environment, and the characteristics of the games used. Based on a review of several journals, the success of this approach does not solely depend on the type of game chosen, but is also largely determined by how play activities are designed, implemented, and supported by an environment conducive to children's learning. (Kohli, 2025)

One of the main obstacles lies in the limited understanding and ability of teachers to implement play-based learning. Not all educators have the competence to design play activities with clear and directed learning objectives. In practice, it is still found that games are only used as a diversion or time filler without thorough planning. In fact, for play activities to truly impact children's cognitive development, systematic planning is needed, starting from selecting the type of game, determining learning objectives, to appropriate mentoring strategies. If the teacher's role is not optimal, the potential of games as a learning medium will not be utilized maximally. (Nhase et al., 2025) found that practitioners in early childhood education settings often struggle to balance structured learning objectives with the open-ended nature of play, particularly in resource-limited settings; they further emphasize that applying the principles of the Zone of Proximal Development (ZPD)—where adults provide targeted support during play—can significantly enhance children’s social interaction skills and overall cognitive engagement.

Furthermore, the inappropriate selection of educational play tools is also a significant inhibiting factor (Damayanti et al., 2022). Not all types of games automatically have educational value that suits children's learning needs. A game can be considered educational if it has clear objectives, can train basic concepts, and encourages children to think actively. If the games used are not appropriate for the child's age, interests, or developmental stage, the expected cognitive stimulation will not be achieved optimally. In fact, games that are too easy can make children quickly bored, while games that are too difficult can reduce children's motivation and interest in learning.

Limited facilities and infrastructure also become an obstacle in the implementation of play-based learning. Not all educational institutions have adequate facilities, both in terms of the number and variety of educational play tools. As a result, play activities become less varied and tend to be monotonous, thus unable to provide optimal stimulation for children's cognitive development. In fact, a variety of games is very important to provide rich learning experiences and stimulate various aspects of children's thinking skills comprehensively.

Another factor that influences is limited time and ineffective management of learning activities. Play-based learning fundamentally requires sufficient time for children to explore, try various possibilities, and understand concepts in depth. However, in reality, time constraints

often make play activities rushed or incomplete. This results in children not having enough opportunity to complete the learning process thoroughly, thus hindering the optimal development of their thinking skills.

In addition, lack of support from the environment, both from the school and parents, also poses a challenge in implementing play-based learning. There is still a view that play is not a serious part of learning activities, so learning is more focused on conventional methods such as reading and writing. In fact, various research results show that play is the most effective way for early childhood to learn (Kumar, 2026; Sitorus et al., 2025). This lack of understanding can hinder the maximum implementation of play-based learning. This is supported by the findings of (Alotaibi, 2024), who, through a systematic review and meta-analysis, demonstrated that the implementation of game-based learning in the context of early childhood education consistently yields significant positive impacts on children's cognitive, social, and emotional development.

Internal factors of the child also cannot be ignored. Emotional conditions and individual characteristics, such as lack of self-confidence, low motivation, or unpleasant learning experiences, can affect children's involvement in play activities. Children who do not feel comfortable or are less interested tend not to actively participate, so the expected cognitive stimulation cannot be achieved. Furthermore, differences in developmental levels between children also pose a challenge for teachers in designing activities that can accommodate the needs of all children.

Overall, the obstacles in implementing play-based learning cover various aspects, ranging from limited teacher competence, inappropriate game selection, limited facilities, suboptimal time management, to lack of support from the environment and differences in children's characteristics. Therefore, planned and continuous efforts are needed, such as improving educator competence, providing adequate facilities, and support from parents and the school environment, so that play-based learning can be implemented effectively and contribute optimally to early childhood cognitive development.

5. Effectiveness of Puzzle Games in Improving Children's Cognitive Abilities

Play media like puzzles are known to be highly effective in improving early childhood cognitive abilities. Based on various research studies, puzzles are one of the educational play tools that can stimulate children's thinking development holistically (Alika K et al., 2025). This is because in puzzle games, children not only play passively but are also directly involved in the process of thinking, observing, and solving problems. These activities make puzzles a simple learning medium, but one that has a significant impact on cognitive development.

In practice, puzzle games require children to arrange picture pieces into a complete form. This process requires children to pay attention to details such as shapes, colors, and patterns of each piece. Through this activity, children's visual perception skills develop, including recognizing patterns and differentiating shapes. Additionally, children also use their memory to recall pieces they have tried before, thus training their memory skills. Research shows that puzzle play activities can improve visual observation and pattern recognition skills, which are important foundations for cognitive development. (Asmawati, 2023) argues that the development of digital puzzle games based on local cultural content has been shown to significantly improve learning outcomes among young children. These findings indicate that puzzle media designed by integrating cultural contexts relevant to children are more effective in stimulating cognitive engagement, while also making the learning process more meaningful and contextual in line with the children's experiential backgrounds. This underscores that the relevance of cultural context in the design of educational learning media is a critical factor that must be seriously considered in efforts to optimize the cognitive development of young children.

More than that, puzzles also play a role in developing logical and structured thinking skills. Children need to understand the relationships between parts, determine the correct position, and devise effective steps to complete the game. This process indirectly trains children to think systematically and understand cause-and-effect relationships. In other words, puzzles not only train basic thinking skills but also help develop higher-order thinking skills such as analysis and reasoning. (Lusiana & Aziz, 2024) specifically identified that young children engaged in puzzle-playing activities inherently employ two cognitive approaches simultaneously: algorithmic

thinking, reflected in the application of systematic and structured procedures, and heuristic strategies, which rely on intuition and accumulated prior experience. These findings indicate that puzzle-playing activities do not merely involve simple motor skills but substantively activate complex, multi-layered cognitive processes in young children. This reinforces the understanding that puzzles are a learning medium with high cognitive depth, making them relevant and effective when integrated into planned early childhood development stimulation programs. One of the main advantages of puzzle games is the process of trial and error. Children will try various possibilities in assembling puzzle pieces, and from each mistake, they learn to find more precise strategies. This process is crucial in developing problem-solving abilities, flexible thinking, and decision-making skills. Research also shows that play activities involving direct problem-solving, such as puzzles, can enhance children's creativity and critical thinking skills. (Alika K et al., 2025)

In addition to impacting cognitive aspects, puzzle games also influence children's learning attitudes. Children become more focused, patient, and persistent in completing tasks. They learn not to give up easily despite facing difficulties. Research shows that using puzzles can increase children's concentration and persistence in learning. This ability is very important because it is directly related to children's readiness to receive more complex learning at the next stage.

Puzzles also have the advantage of flexibility in their use. The difficulty level of puzzles can be adjusted to the child's age and ability, thus providing appropriate challenges. If too easy, children will not develop, while if too difficult, children can lose interest. Therefore, choosing the right puzzle is an important factor to maximize the benefits gained. In the play-based learning approach, puzzles become a very relevant medium because they can combine elements of learning and play in one activity. Children learn without pressure, so the cognitive process proceeds naturally and optimally. This differs from conventional learning which tends to make children passive and less directly involved. In the context of digital technology development, (Annuar et al., 2025) reveal that the use of mobile game-based learning applications has proven effective in optimizing the cognitive development of young children by providing an adaptive and interactive learning environment that is responsive to each child’s individual learning pace and style. These findings indicate that the integration of digital platforms as an extension of conventional puzzle and game-based learning approaches has the potential to serve as a strategically valuable complementary tool, both in expanding learning accessibility and in personalizing cognitive stimulation to align more precisely and measurably with the needs and developmental characteristics of young children.

Overall, the effectiveness of puzzle games in enhancing children's cognitive abilities lies in their capacity to stimulate various aspects of thinking simultaneously, from visual perception, memory, logical reasoning, to problem-solving. Coupled with an enjoyable learning atmosphere, puzzles become one of the most effective and recommended learning media for supporting optimal early childhood cognitive development.

CONCLUSION

Based on the findings and discussions, educational play activities have a very strategic role in supporting early childhood cognitive development. Play is no longer seen as merely a leisure activity, but rather as a natural and appropriate learning method for children's developmental characteristics. Through play activities, children can build knowledge gradually through direct experience, starting from environmental exploration, reasoning, problem-solving, and meaningful social interaction in a positive emotional atmosphere.

The play-based learning approach is proven more effective than conventional learning because it can encourage children's activeness, develop higher-order thinking skills, and provide space for creativity and social interaction. Various types of educational play, such as constructive play, traditional play, role-playing, and social play, have complementary contributions in stimulating children's cognitive aspects. Games like puzzles, for example, can train logical thinking, memory, visual perception, and problem-solving skills, while also fostering patience and persistence.

However, the implementation of play-based learning still faces various challenges, including limited teacher competence in designing directed activities, limited facilities and infrastructure, and a lack of understanding from the surrounding environment regarding the

importance of play as a learning medium. Additionally, differences in children's characteristics and developmental stages are also factors that need to be considered in its implementation.

Based on these conclusions, several recommendations can be made. Educators need to improve their professional competence in designing and implementing play-based learning that is planned and appropriate to the child's developmental stage. Educational institutions are expected to be able to provide adequate educational play facilities and infrastructure and manage learning time effectively. In addition, an active role from parents and the community is needed to foster an understanding of the importance of play as a learning medium, creating synergy between the school and home environments. In selecting games, it is important to adjust them to the child's age and abilities to provide appropriate challenges. Thus, the implementation of play-based learning can run optimally and make a maximum contribution to overall cognitive development.

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