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Development of a Plywood-Based Wall Climbing Game to Enhance Cognitive Skills of 5–6-Year-Old Children

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Abstract
This study aims to develop an instructional media in the form of a Wall Climbing game made from plywood to enhance cognitive abilities, particularly in problem-solving, among children aged 5–6 years at TK PKK Kotagajah. The research was motivated by preliminary findings indicating that the children's cognitive development had not yet reached optimal levels despite ongoing classroom instruction. The method employed in this study is Research and Development (R&D), using the Borg and Gall model. Data were collected through observation, interviews, questionnaires, and documentation. The developed product emphasizes educational value, is tailored to the characteristics of early childhood learners, and is designed to be both safe and engaging. The results of the study demonstrate that the Wall Climbing game is effective in improving the cognitive abilities of children aged 5–6 years, particularly their problem-solving skills. This is evidenced by an increase in various cognitive indicators after using the learning media, such as exploratory behavior, application of prior knowledge in new contexts, and the ability to express creative ideas. The game also successfully fostered enthusiasm and motivation for learning throughout the instructional process. Therefore, the plywood-based Wall Climbing game can serve as an innovative and enjoyable alternative learning medium for promoting cognitive development in early childhood education.

Keywords: *Wall Climbing Game, Plywood, Early Childhood, Cognitive Ability*

INTRODUCTION

Play is a fundamental activity in early childhood that serves as a natural and enjoyable way for children to learn and develop. It is widely recognized that through play, children not only entertain themselves but also gain important life skills.(Info and Game 2022) According to early childhood education experts, play supports children's growth in various domains such as physical, emotional, social, moral, and especially cognitive development. When engaged in play, children explore their world, practice decision-making, and learn to solve problems in ways that are meaningful to them(Al et al. 2024).

Cognitive development is one of the key areas of growth in early childhood, particularly between the ages of 5 and 6. At this stage, children begin to demonstrate emerging abilities in logical thinking, classification, and problem-solving. The ability to solve problems is not only an academic skill but also a life skill that enables children to adapt and thrive in everyday situations. Supporting the development of this ability

through appropriate educational strategies is essential in preparing children for future learning experiences.(Nada and Putra 2023)

Traditional classroom instruction may not always address the developmental needs of young children, especially when it comes to active, experiential learning. Therefore, educators must employ creative approaches and tools to engage children in meaningful learning. (Primayana 2020)One such approach is through the development of educational games that combine play with cognitive stimulation. Educational games can help children grasp abstract concepts by connecting them with concrete, hands-on experiences that are both enjoyable and educational (Binasdevi et al. 2024).

Wall Climbing, traditionally known as a physical sport, can be creatively modified to support cognitive learning. By transforming this activity into a classroom-appropriate educational tool using safe materials like plywood (triplek), the game can be adapted to enhance children's problem-solving skills. This modified version allows children to interact with geometric shapes, numbers, and colors while completing specific cognitive tasks. It also encourages exploration, creativity, and social interaction.

The use of this game is especially relevant at TK PKK Kotagajah, where initial observations and interviews with teachers revealed that children's cognitive problem-solving abilities had not developed as expected. Despite ongoing instructional efforts, many children showed limited capacity to apply flexible and creative thinking to simple, everyday problems. This indicates a need for more interactive, developmentally appropriate media that can support and accelerate cognitive growth in this age group.(Pembelajaran, Kelas, and Sd 2022)

Based on these needs, this research seeks to develop and implement a modified Wall Climbing game using plywood as a learning medium. The aim is not only to introduce a new and engaging activity into the classroom but also to provide a structured and effective method for stimulating children's cognitive development. By incorporating elements of problem-solving, classification, and reasoning, the game is designed to support the goals outlined in the national early childhood education standards.

This study uses the Research and Development (R&D) method to create, test, and refine the learning media based on field data and expert validation. The findings are expected to contribute to the field of early childhood education by offering a practical, innovative tool that enhances children's cognitive problem-solving abilities. It is hoped that this research will also inspire further development of playful learning media tailored to the unique needs of young learners.(Media et al., n.d.)

METHODOLOGY

This study utilized a Research and Development (R&D) approach based on the model proposed by Borg and Gall. The method was chosen to develop and evaluate an educational product—specifically, a Wall Climbing game made from plywood (triplek)—designed to enhance the cognitive problem-solving skills of children aged 5–6 years at TK PKK Kotagajah. The research process consisted of several phases, including preliminary research, product design, expert validation, limited field testing, product revision, and final product evaluation.(Audi 2018)

Data were collected using a variety of techniques to ensure accuracy and reliability. These included classroom observation, teacher and expert interviews,

documentation, and questionnaires administered to early childhood education experts and practitioners. The observation focused on identifying the baseline cognitive development of children in terms of their problem-solving abilities, while the interviews aimed to gather insights regarding the suitability, practicality, and appeal of the game as a learning tool. Expert validation was conducted by two professionals—one in the field of early childhood education and one in educational media—to assess the content and instructional design of the developed product.(Nada and Putra 2023)

The research subjects consisted of children in class B (ages 5–6 years) at TK PKK Kotagajah, totaling 14 students. The effectiveness of the developed game was measured by comparing pre- and post-intervention performance based on cognitive indicators from the National Standards for Early Childhood Education (STPPA). The results were analyzed quantitatively using percentage-based scoring to determine improvements in children's ability to engage in exploratory activities, apply knowledge in new contexts, and demonstrate creativity in solving problems. The findings informed the final revision of the Wall Climbing game, ensuring that it was safe, engaging, and educationally effective.

RESULTS AND DISCUSSION

The development of the Wall Climbing game using plywood began with an initial needs analysis conducted at TK PKK Kotagajah. Through observation and interviews with classroom teachers, it was discovered that children aged 5–6 years demonstrated low achievement in cognitive problem-solving abilities. Many children were unable to explore their environment effectively, (Hidayanti, n.d.)apply prior knowledge to new contexts, or show creativity in addressing simple problems. This finding emphasized the urgent need for an innovative learning media that could support cognitive development in a more engaging and interactive way.

Based on this need, a prototype of the Wall Climbing game was designed using safe and accessible materials,(Al et al. 2024) with a primary component being plywood. The game was structured to incorporate tasks involving geometric shapes, numbers, colors, and logical decision-making. It featured a board with interactive elements, such as flannel shapes attached with velcro, number balls, and a pull-string system, all designed to stimulate children's thinking while ensuring safety and enjoyment. The game was aligned with the themes used in the school curriculum, particularly the "Myself" theme and the sub-theme "My Favorite Color."

After the design phase, expert validation was carried out by two professionals: a material expert and a media expert. Both validators rated the product as appropriate for the target age group and effective in stimulating cognitive skills. Suggestions from the experts led to several improvements, such as increasing the visual contrast of certain components, enlarging shape patterns for easier handling, and adjusting instructions to be more child-friendly. These revisions enhanced both the functional and aesthetic quality of the Wall Climbing game(Media et al., n.d.).

Following validation and revision, the product was implemented in a classroom setting with 14 students in Class B. During the implementation, children showed high levels of interest and engagement. The game encouraged exploratory behavior as children selected shapes, matched colors, counted objects, and pulled number-tagged balls into matching slots. Observations showed that students displayed increased focus, initiative, and creativity while interacting with the game. Teachers also reported that the game made the learning process more dynamic and joyful.

Quantitative data collected through observation checklists revealed significant improvement in the cognitive problem-solving indicators. Before the intervention, only 5 out of 14 students had reached the "Beginning to Develop" stage, with the rest categorized as "Not Yet Developed." After implementation, most students advanced to "Developing As Expected" or even "Well Developed" in indicators such as applying knowledge in new contexts and demonstrating creative solutions. These results provide strong evidence that the Wall Climbing game effectively supports cognitive development in early childhood. In addition to cognitive growth, the game also fostered social-emotional development, as children took turns, waited patiently, and encouraged one another during gameplay. This reinforces the value of play-based learning not only in academic areas but also in shaping well-rounded, cooperative learners. The teacher's role as facilitator was crucial in guiding children through challenges and encouraging problem-solving behavior in a supportive environment.

In conclusion, the Wall Climbing game made from plywood proved to be a valuable learning medium for enhancing cognitive problem-solving skills among children aged 5–6 years. It successfully combined physical interaction with cognitive stimulation, offering a holistic learning experience. The research demonstrated that when properly designed and implemented, educational games can serve as powerful tools in early childhood education. The success of this product also opens opportunities for further development of similar learning media tailored to other areas of child development.

Product Trial Results

The product trial phase was conducted with children aged 5–6 years in Class B at TK PKK Kotagajah, involving 14 students. Prior to the implementation, a pre-survey was conducted to assess the children's baseline cognitive abilities, particularly in problem-solving. The data revealed that 9 children were still in the "Not Yet Developed" category and only 5 were "Beginning to Develop" according to STPPA standards. These findings confirmed the necessity of an effective learning tool to stimulate cognitive growth, particularly in flexibility, exploration, and creative thinking.

During the trial, the Wall Climbing game was integrated into classroom activities under the guidance of the researcher and class teacher.(Media et al., n.d.) Children were introduced to shapes and colors, then asked to match, count, and interact with numbered elements by pulling strings attached to the game board. Throughout the sessions, children showed enthusiastic participation. Their ability to engage with the problem-solving tasks gradually improved, as they became more confident in recognizing patterns, making decisions, and applying previously learned concepts in new contexts.

Post-trial observations showed a significant increase in cognitive achievement. The number of students categorized as "*Developing as Expected*" increased substantially. Children demonstrated improvements in all four cognitive indicators: exploratory behavior, flexible problem-solving, application of knowledge in new contexts, and creativity. Based on the analysis of observational data and teacher feedback, the Wall Climbing game was considered effective and developmentally appropriate as a cognitive learning medium. Furthermore, the game was praised for promoting both individual focus and collaborative learning experiences in a playful and engaging environment.

Product Revision Results

Following the expert validation phase, several revisions were made to improve the Wall Climbing game and ensure it met safety, functionality, and developmental appropriateness standards. The material expert suggested adjustments to the game board's layout to enhance clarity and usability. For instance, the size of the geometric shapes was increased to better suit children's hand coordination, and the arrangement of the shapes was simplified to avoid confusion. In addition, the game's visual elements, such as color contrast and numbering, were refined to better support children's visual recognition and cognitive processing.

The media expert recommended improvements to the physical construction and instructional aspects of the product. One key suggestion was to reinforce the edges of the plywood board to prevent splinters and ensure safety during play. The pull-string mechanism was also tested and revised to ensure smooth movement and avoid tangling, making it easier for children to engage independently. Furthermore, the instructional guidelines for teachers were clarified and rewritten in child-friendly language, ensuring that the game could be introduced and facilitated smoothly in classroom setting.

After the revisions were implemented, the updated version of the Wall Climbing game was re-evaluated during classroom use. Both teachers and students responded positively to the improvements. Children found the game more attractive and easier to understand, while teachers found the media more manageable and aligned with lesson objectives. These revisions enhanced the overall effectiveness and usability of the learning tool, making it suitable for broader classroom application and future development.

Final Product Review

The final version of the Wall Climbing game was developed through a structured and iterative process that included expert validation, product trials, and revisions. The final product consisted of a 60x56 cm plywood board featuring a pull-string mechanism, geometric shapes made from flannel, numbers, and interactive visual elements. This educational tool was designed to enhance children's cognitive problem-solving abilities by integrating elements of exploration, classification, numerical understanding, and creative thinking into a play-based learning experience.

After revisions, the game was more visually engaging, safer, and easier to use. The added improvements—such as clearer instructions, smoother pull-strings, and appropriately sized shapes—contributed to more effective interaction between the children and the learning media. Additionally, the flannel shapes and color contrasts supported visual discrimination and recognition, while the process of counting and matching with numbered balls enhanced children's logical and mathematical thinking. The final product aligned well with the curriculum theme "Myself" and the sub-theme "My Favorite Color," making it easily adaptable to classroom learning.

From a cognitive development perspective, the game successfully targeted the four key indicators outlined in the National Early Childhood Education Standards (STPPA), namely: engaging in exploratory activities, applying knowledge in new contexts, solving simple problems flexibly, and demonstrating creativity. The children's performance during the final implementation reflected measurable improvements in all these areas. They not only participated actively but also began to demonstrate greater independence and initiative in completing the tasks.

The game also proved valuable as a collaborative learning tool. While the activity was performed individually, it encouraged peer support, turn-taking, and group observation—fostering social-emotional skills alongside cognitive growth. Teachers reported that students were more focused and enthusiastic during the learning sessions that included the Wall Climbing game. Furthermore, the game's hands-on and multisensory approach helped children with different learning styles to engage meaningfully with the material.

In summary, the final product of the Wall Climbing game using plywood emerged as an innovative and effective educational media for early childhood learners. It combined the principles of active learning, child safety, curriculum relevance, and developmental appropriateness. The positive outcomes observed during the implementation support its continued use in classroom environments and suggest potential for future development into a modular or thematic learning kit adaptable for other cognitive or developmental domains.

CONCLUSION

Conclusion provides a summary of the description of the results and discussion, referring to the research objectives. Based on these two things, new ideas are developed which are the essence of the research findings.

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