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## Development of Interactive "Fruit Game" Learning Media to Improve Cognitive Abilities in Early Childhood

### *Pengembangan Media Pembelajaran "Fruit Game's" Interaktif untuk Meningkatkan Kemampuan Kognitif Pada Anak Usia Dini*

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### Abstract

The use of learning media in early childhood education is still limited and tends to be traditional in approach, making it less appealing to children. This situation results in the cognitive development of early childhood not reaching its maximum potential due to the lack of interactive and enjoyable learning tools. This study aims to develop an interactive game media called "Fruit Game's" to improve the cognitive development of early childhood. The type of research used is Research and Development (R&D) with the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The research was conducted at Al-Azhar Kindergarten with subjects aged 4-5 years. The data collection instruments were interviews and validation questionnaires from media experts, subject matter experts, and language experts. The interactive "Fruit Game's" media was declared suitable for use based on the experts' assessment, and media users can improve children's cognitive abilities in recognizing colors, shapes, and simple counting concepts. Interactive educational game learning media is recommended for early childhood teachers as an innovative learning medium to improve the cognitive abilities of early childhood.

**Keywords:** cognitive development; early childhood; fruit game's; interactive; media

### Abstrak

Penggunaan media pembelajaran di PAUD masih terbatas dan cenderung pada pendekatan tradisional, membuat kurang menarik bagi anak. Situasi ini mengakibatkan perkembangan kognitif pada anak usia dini belum mencapai potensi maksimal di sebabkan kurangnya alat pembelajaran yang bersifat interaktif dan menyenangkan. Penelitian ini bertujuan mengembangkan media game interaktif "Fruit Game's" untuk meningkatkan perkembangan kognitif anak usia dini. Jenis penelitian yang digunakan adalah Research and Development (R&D) dengan model ADDIE yang meliputi tahap analisis, desain, pengembangan, implementasi, dan evaluasi. Penelitian dilaksanakan di TK Al-Azhar dengan subjek anak usia 4-5 tahun. Instrumen pengumpulan data berupa wawancara dan angket validasi dari ahli media, ahli materi, dan ahli bahasa. Media "Fruit Game's" interaktif dinyatakan layak digunakan berdasarkan penilaian para ahli dan pengguna media dapat meningkatkan kemampuan kognitif anak dalam mengenal warna, bentuk, serta konsep berhitung sederhana. Media pembelajaran games edukasi interaktif direkomendasikan bagi guru PAUD sebagai media pembelajaran yang inovatif untuk meningkatkan kemampuan kognif anak usia dini.

**Kata kunci:** anak usia dini; game buah; interaktif; media; kemampuan kognitif

## A. INTRODUCTION

In the context of Indonesian education, the Early Childhood Education (PAUD) curriculum emphasizes the importance of cognitive stimulation through activities such as classifying objects, distinguishing shapes and colors, sorting sizes, recognizing number symbols, and recognizing cause-and-effect patterns (Lestari et al., 2024). Education is a planned process, aimed at maximizing individual potential to adapt to society and face the changing times. Through education, a person not only gains knowledge but also hones thinking, social, and emotional skills, and builds character values that are crucial for life. Therefore, education must begin at an early age as a foundation for a child's future development (Khadijah, 2019).

Cognitive development is a fundamental aspect of early childhood education because it relates to how children process information, understand the world around them, think logically, and solve simple problems. At an early age, cognitive processes are developed not only through the ability to remember and recognize objects, but also through the ability to make connections between concepts, associate new information with previous experiences, and actively explore their environment (Humaida & Suyadi, 2021). Children aged 2–7 years are in the preoperational stage, which is the stage when children begin to use symbols, imitate, and role-play. At this stage, children's thinking is still inclusive and strongly influenced by what they witness directly (Piaget, 1952). They manipulate simple information based on their sensory perceptions (Utami et al., 2021). However, their thinking is still intuitive, egocentric, and they do not yet understand complex logical concepts (Hasanah, 2018). Therefore, appropriate, engaging, and developmentally appropriate pedagogical stimulation is essential for optimal development of children's cognitive abilities (Putu et al., 2021).

Early Childhood Education (PAUD) is a stage of education that stimulates various aspects of a child's development from birth to six years. During this phase, children experience very rapid development, often referred to as the golden age. During this period, various aspects such as cognitive, language, social-emotional, moral and motor skills develop very rapidly and require appropriate stimulation through learning activities that are appropriate for the characteristics of early childhood (Khadijah, 2019).

One crucial developmental element in early childhood education is cognitive development. Cognitive development relates to a child's ability to think, comprehend information, solve problems, and enhance creativity. Appropriate stimulation for cognitive development can help children develop logical and critical thinking skills from an early age. Therefore, learning in early childhood education (PAUD) needs to be designed in an engaging, interactive, and developmentally appropriate manner to provide meaningful learning experiences (N. Nasution & Maulana, 2020).

However, based on initial observations in several early childhood education institutions, it appears that the teaching methods used still tend to be traditional, teacher-focused. The limited use of media for learning results in children being less actively involved in the learning process. Furthermore, the media used is still dominated by printed materials or simple teaching aids, thus not maximizing stimulation for children's cognitive development. This situation can lead to low interest in learning and low participation during the learning process (Melati et al., 2019).

This problem can be caused by several factors, including a lack of innovative learning media, minimal use of technology in the teaching and learning process, and a lack of media development appropriate to the characteristics of early childhood. With the current development of digital technology, there is a significant opportunity to create more engaging and interactive learning media for children. The use of interactive digital learning media can help teachers deliver material in a more varied, visual, and enjoyable way, allowing children to learn through more meaningful experiences (Aryani & Ambara, 2021).

One solution to this problem is to create interactive digital learning media specifically designed for early childhood. Interactive digital learning media allows children to learn through images, animations, sounds, and interactive activities, which can increase their attention span and motivation to learn. By implementing appropriate media, it is hoped that the learning process can be more effective in stimulating children's cognitive development (Humaida, 2021).

Research on the development of interactive digital learning media in early childhood education is crucial to support learning innovations that align with technological advances and student needs. This research is urgently needed to offer alternative learning media that can help teachers improve the quality of learning in early childhood education and provide optimal stimulation for children's cognitive development (Vanni, 2020).

The novelty of this study lies in the creation of interactive digital learning media specifically designed to meet the needs of early childhood, and linked to learning activities that encourage active participation. Therefore, the created media not only functions as a learning aid but also as a way to stimulate children's cognitive development more effectively. However, field practice shows that the learning media used by most early childhood education institutions is still dominated by traditional media such as printed worksheets and static images (Adawiah et al., 2022). These conventional media lack concrete and interactive experiences for children, often leading to boredom, lack of focus, and disengagement from active learning (Usmadewi, 2024). Learning with minimal media variety can hinder the development of mental representation and problem-solving skills in early childhood because it does not provide space for children to explore (Widyatmojo & Muhtadi, 2017).

The use of technology for learning plays a crucial role in achieving effective and collaborative learning activities (Mutia et al., 2022). Today's children grow up in an environment filled with visual, audio, and digital interactive stimuli, including animations, moving icons, educational videos, and app-based games (Sari & Suyadi, 2015). A digital lifestyle influences the way children learn and process information; they tend to be more responsive to moving visuals, cheerful sounds, and interactions that provide immediate feedback (Widiyaningrum et al., 2025). Digital media designed according to the principles of *Developmentally Appropriate Practice* (DAP) can improve attention, learning motivation, critical thinking skills, and the quality of children's interactions with learning materials (N. Nasution et al., 2019).

Educational digital games, or interactive educational games, are a form of technology proven effective in supporting children's cognitive development (Dwita & Hidayati, 2021). Digital games provide learning experiences based on exploration, experimentation, decision-making, and instant feedback, enabling children to learn actively and meaningfully (Mesiono et al., 2020). These games also encourage matching, sorting, sequencing, classification, and pattern recognition, which are key foundations of early childhood cognitive development (Ifada & Mukminin, 2025). These activities help children understand logical relationships between objects, recognize sequences, distinguish shapes and colors, and develop symbolic thinking skills (Aryani & Ambara, 2021).

Fruit recognition is a concrete topic that is highly effective for teaching using an interactive approach (Satriana et al., 2022). Fruit is a familiar object to children, offers engaging visual variety, and can be used to teach many basic cognitive concepts such as color, size, shape, category, and structure (Triani et al., 2021). However, learning about fruit is often done solely through static images or verbal explanations, thus not providing an in-depth learning experience (Putri & Daryuni, 2024). However, early childhood learns best through direct interaction with dynamic, manipulative, and explorable visual representations (Ngatmin Abbas et al., 2025).

Based on these needs, the Interactive Fruit Games were developed, a digital game-based learning medium specifically designed to enhance the cognitive abilities of early childhood. This medium contains various activities ranging from recognizing fruit types, matching fruit shadows, grouping fruit based on certain categories, to sorting fruit sizes from smallest to largest or vice versa. Each activity is structured in stages to suit the child's cognitive developmental level, ranging from simple to more complex levels. The game is also designed with bright and engaging visuals, simple navigation, child-friendly audio instructions, and immediate feedback so that children can understand whether their answers are correct or need to be corrected (Rahma & Widyasari, 2023).

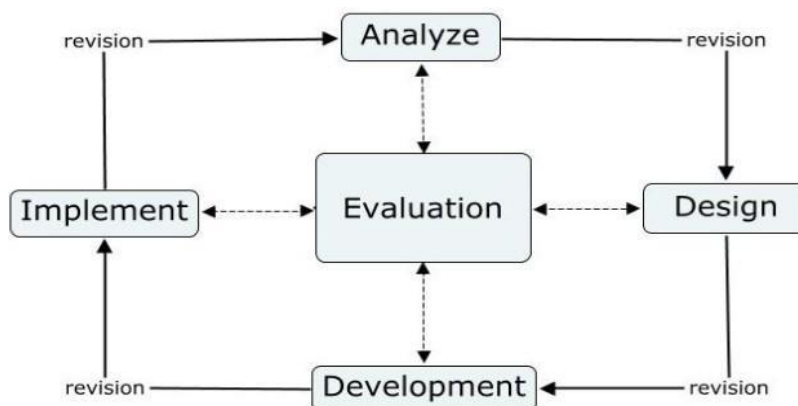
Development “*Fruit Game's*” Interactive media offers benefits not only for children but also for teachers. For children, this media provides opportunities to learn through exploration, manipulation of digital objects, and problem-solving, allowing thinking processes to develop naturally without feeling forced. For teachers, this media helps create more interactive and varied learning experiences than conventional media. Teachers act as

facilitators, accompanying children in the exploration process of play. This situation makes learning more participatory and enhances interaction between teachers and children.

Thus, the development of “*Fruit Games*” Interactive games are a relevant solution for improving the quality of early childhood education (PAUD), particularly in terms of cognitive development. This media combines elements of play and learning in one engaging and easy-to-use digital platform. In addition to enhancing children's thinking skills, this media also fosters a positive attitude toward learning, increases motivation, and provides a more meaningful learning experience. Therefore, Interactive Fruit Games have great potential for widespread implementation in PAUD education, both at school and at home, as an effective form of cognitive development stimulation.

## **B. RESEARCH METHODS**

This type of research is R&D development (*Research and Development*). Using the model developed by Walter Dick and Lou Carey through the ADDIE stages, namely analysis, design, development, implementation, and evaluation (Dick et al., 2015). It was chosen because it provides structured stages in designing and developing digital learning media, including interactive educational games. The application of this model in digital media development research in PAUD shows a high level of validity and product feasibility (Veryawan, Syahputra Hermawan, Sriadhi, 2025). The research was conducted at Al-Azhar Kindergarten with 17 early childhood subjects consisting of 10 boys and 7 girls. This development is by implementing changes to the development research from Robert Maribe Branch in (Sugiyono, 2011) is commonly known as the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). This ADDIE model creates a design model for learning that is very interesting and can be developed systematically and is based on the theoretical foundation of learning design. The following is Figure 1. The stages of using the ADDIE model development according to (Maisarah et al., 2026).



**Figure 1. Stages of Using the ADDIE Model Development**

The development stages of the ADDIE Model are: (1) Analysis Stage, which is about analysis of needs and analysis of characteristics, for this analysis stage, in-depth observation of characteristics in the learning context is carried out. (2) Design Stage, which is about designing materials and designing the creation of learning media. (3) Development Stage, which is developing interactive learning game media based on designs that have been designed by researchers. After undergoing the development stage, validation tests are carried out by 3 validators, namely lecturers. (4) Implementation Stage, which is the stage of using interactive game media during the learning process. The product of this development is an interactive game that has been improved and tested on users, namely AUD and teachers. (5) The final stage is the evaluation stage. For this stage, researchers conducted assessments/evaluations from users for this interactive game development product.

Data collection techniques are the methods used by researchers to obtain the information needed for a study. In this study, data collection was conducted through interviews and questionnaires. Interviews were applied during the needs analysis phase to obtain information related to learning conditions, the use of existing learning media, and teachers' needs for the learning media to be developed. These interviews were conducted with classroom teachers to uncover information about challenges faced in teaching and learning activities and teachers' expectations for innovative and interactive learning media.

In addition to interviews, data collection also involved the use of questionnaires. The questionnaires aimed to gather information regarding the feasibility of the designed

learning media. The questionnaires were distributed to validators consisting of media experts, material experts, and language experts. The assessments provided by these experts aimed to assess the quality of the developed learning media before testing it with users. Data collection methods through interviews and questionnaires are approaches frequently used in educational research to obtain information directly from respondents and expert validators (Arikunto, 2018).

### C. FINDINGS AND DISCUSSION

This research produces a product in the form of learning media in the form of learning about fruit through the media "*Fruit Game's*", which aims to introduce papaya to early childhood. The media development process was carried out using the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation (R. A. Nasution & Amelia, 2024).

In the analysis stage, initial observation data was obtained, indicating that early childhood children still experience difficulties in recognizing various types of fruit, differentiating fruit sizes, and simply counting objects when learning is conducted conventionally without engaging media. Furthermore, children tend to quickly become bored and less active when only given verbal explanations by teachers. Based on these conditions, interactive and fun learning media are needed so that children can learn while playing. Therefore, researchers developed this educational media game-based learning entitled "*Fruit Game's*" "Getting to know fruit." This game is designed to help children learn fruit names, practice simple counting skills, and develop logical thinking skills through activities such as guessing fruit types, counting fruits, and sorting fruits by size. This educational game is expected to increase children's interest in learning, active engagement, and understanding, in line with the developmental characteristics of early childhood.



At the design stage, the researcher designed educational game-based learning media with the title "*Fruit Game's*", which is adapted to the characteristics of early childhood development. The game design includes the selection of interactive templates, with the use of bright colors, attractive fruit illustrations, and simple text and instructions for easy understanding by children. The game flow is designed in stages, starting from the introduction of types of fruit, a game of guessing the names of the fruit, counting the






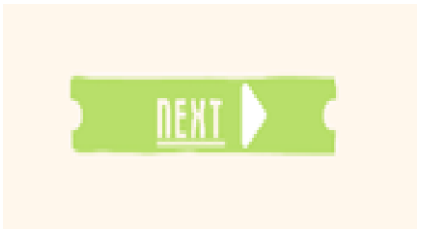
number of fruits, to sorting the fruits by size from small to large or from large to small. Each question is presented in the form of multiple choices A, B, and C. In addition, the game design also includes direct feedback in the form of "correct answers" and "wrong answers" displays so that children can find out the results of their answers independently while playing.

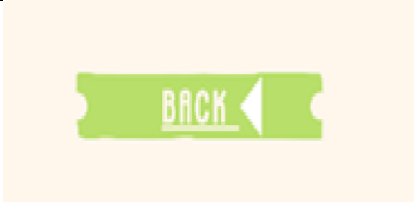

In the media creation process, researchers used several digital platforms, namely Canva AI, Microsoft PowerPoint, and CapCut. These platforms were used to create visual designs such as animated characters, backgrounds, and image elements that support the storyline. Microsoft PowerPoint was used to create interactive quizzes and simple puzzles aimed at strengthening children's understanding of the story content. Meanwhile, CapCut was used in the video editing stage, such as adjusting image display duration, adding transition effects, inserting narration, and adding background music to make the video more engaging and interactive.

In the development stage, a learning media product was produced in the form of an interactive educational game entitled "*Fruit Game's*" which aims to improve the cognitive abilities of young children in recognizing types of fruit, simple counting, and sorting objects by size. The product display is presented in Table 1.

**Table 1. Media Products “*Fruit Game’s*” for Early Childhood Learning**

Product Components	Display Components	Information
Start page		It features the title Fruit Game's and an invitation to play while learning about fruit. The display is designed to be engaging with bright colors to pique children's interest before they start playing.
Instructions page		Contains instructions for using the game presented in simple language so that it is easy for young children to understand before playing.

Product Components	Display Components	Information
Fruit name guessing questions page		Show a picture of a fruit with three answer choices (A, B, C). Children are asked to guess the name of the fruit that matches the picture.
Correct answer feedback page		Display the message “Your Answer is Benar” as positive reinforcement so that children feel confident and motivated to continue playing.
Incorrect answer feedback page		Display the message “Your Answer is Salah” along with a back button so that children can try again without feeling pressured.
Question page for calculating the number of fruits		Show pictures of several fruits and questions about their number to practice children's simple counting skills.
Question page for sorting fruit		Presenting the activity of sorting fruit by size from small to large or from large to small to train logical thinking skills.
Navigation buttons (next/ back)		Used to move between game pages. This button is designed to be simple and easy for children to click.

Product Components	Display Components	Information
		
Cover page		It contains a message of appreciation such as "Great! You're already good at recognizing fruits" and an invitation to play again.

At this point, the design is transformed into a usable product, and a tool is created to measure its performance. Developers will examine the product they intend to create to determine whether it can be used properly and whether all components work as expected (Huda, 2022). Suggestions and feedback obtained are revised or improved; the product should be developed with the addition of several vegetables and several additional slides. The revised product, based on the suggestions, is assessed for feasibility by three validators: a media expert, a language expert, and a material expert, using an assessment instrument. The assessment instrument is first validated by the lecturer to ensure the resulting instrument is valid for use in assessing product feasibility. Data analysis results indicate that the media is valid, so a limited trial is conducted to assess its practicality in interactive game development.

**Table 2. Expert Validation Results**

Aspect	Average Score	Presentation	Category
Media	0.93	94%	Eligible
Linguist	0.96	97%	Eligible
Subject Matter	0.92	92%	Eligible

From the results of the feasibility test by three validators, namely media experts, language experts and material experts, it was shown that interactive digital game

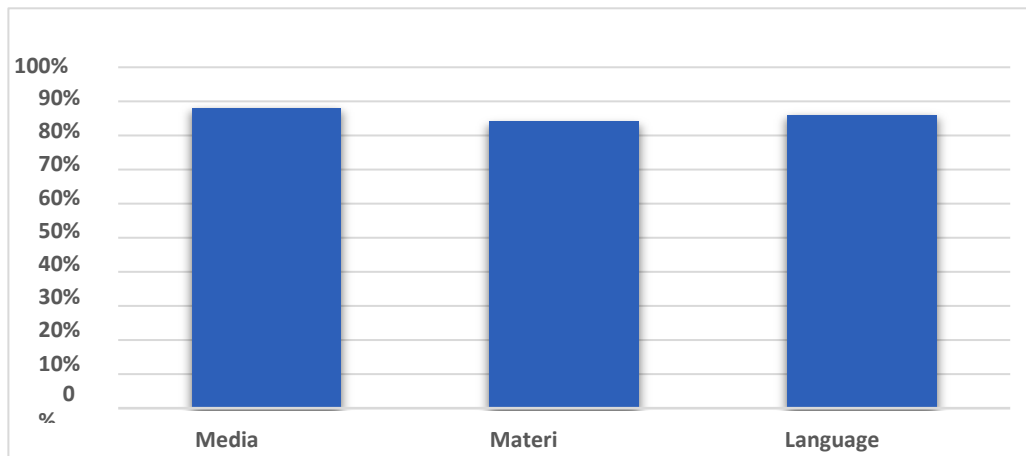
media '*Fruit Game 's*' is suitable for use by teachers as an interactive learning medium for early childhood. Interactive digital game media to improve fruit knowledge in early childhood based on interactive digital game tools designed to help teachers choose the right learning media for early childhood so that learning is fun and interactive.

The implementation phase is the phase after product revisions are made during the development phase. At this stage, the educational game "*Fruit Game 's*" tested on early childhood children at Al-Azhar Kindergarten in Langsa City, researchers introduced educational games "*Fruit Game 's*" to children by projecting the game through a projector. The researcher first explained the game instructions so the children understood how to play, such as selecting available answers and using the next and back buttons. Next, the children were invited to play together by answering questions about guessing the names of the fruits displayed on the screen. During the activity, the researcher also conducted a simple question and answer session regarding the names and shapes of the fruits that appeared in the game. Children were asked to answer questions about counting the number of fruits and sorting them by size from smallest to largest or from largest to smallest. Each child was given the opportunity to choose an answer and received direct feedback in the form of a "correct answer" or "wrong answer" display. During the game, the children were seen helping each other and discussing with their peers in determining the answers. After the game was completed, the researcher observed the children's abilities in recognizing types of fruit, simple counting, and sorting fruits as a basis for assessing the effectiveness of the educational game "*Fruit Game 's*" in early childhood learning.



**Figure 2. Children see how to play Media Fruit Game's**

The evaluation stage in this research was carried out to determine the feasibility and effectiveness of the educational game "*Fruit Game's*" that has been developed. The evaluation was conducted through a validation process by competent validators, assessing the appropriateness of the content, media display, gameplay, and the game's suitability to the developmental characteristics of early childhood. The validators provided suggestions and feedback regarding the clarity of the fruit introduction material, visual design, and ease of use of the game. Furthermore, the evaluation was also conducted through the use of the game in learning activities at PAUD by observing children's responses, interests, and engagement during play. The evaluation results showed that the educational game "*Fruit Game's*" is suitable for use as a learning medium and is effective in helping children recognize types of fruit, do simple counting, and sort fruit in a fun way, so that the feedback obtained can be used as a basis for product improvements. The product presentation is in the form of an interactive educational game entitled "*Fruit Game's*" which was developed to help young children recognize types of fruit, practice simple arithmetic skills, and develop logical thinking skills through play-while-learning activities. After the product was developed, the educational game "*Fruit Game's*" validated by media experts, learning material experts, and language experts with the aim of obtaining assessments, suggestions, and input as a basis for product improvement before being tested on early childhood children.



**Figure 3. Product Validation and Testing Results Section**

## DISCUSSION

Development of interactive learning media “*Fruit Game’s*” Learning about fruit is an innovation in the educational process that can help improve children's thinking skills at an early age. Digital game-based learning media can provide a more engaging learning experience by integrating visual elements, animation, sound, and interactive activities that can stimulate children's thinking. Early childhood learns best through play, so using game-based media can help them understand learning concepts in a more enjoyable way. Research shows that multimedia learning can positively boost early childhood cognitive development by creating a more realistic and engaging learning experience for them (Handayani et al., 2024).

The use of digital learning media such as “*Fruit Game*” can increase children's participation in the learning process. With interactive games, children can recognize various types of fruit, colors, and shapes while engaging in activities such as selecting pictures, matching objects, or answering simple questions. These activities help children develop logical thinking, memory, and grouping skills Information. Research shows that implementing interactive multimedia in early childhood education can create a more engaging learning environment and help children understand the material more easily because information is presented through a combination of images, sound, and animation (Elok et al., 2023).

In addition to improving cognitive abilities, the use of digital game-based learning tools can also increase children's interest in learning. When children engage in learning through engaging games, they tend to be more focused and engaged in the learning process. This is due to digital media. “*Fruit Game’s* It can present educational content in a more realistic way through visuals, audio, and animation, so children can better understand the material. Studies show that the use of interactive multimedia in early childhood education can make the learning process more meaningful and enjoyable, and can also increase children's attention and interest in the material taught by teachers (Putu et al., 2021).

Thus, the creation of interactive learning media “*Fruit Game*” can be an efficient media option for improving cognitive abilities in early childhood. This media is designed to make the learning process more engaging, interactive, and enjoyable, making it easier for children to understand the material being taught. Furthermore, the application of game-based media can also support teachers in developing creative learning processes that align with the characteristics of children's learning styles, which often involve play and exploration. The use of interactive multimedia in education has been shown to increase children's participation and help them understand learning concepts more clearly (Kaffah et al., 2020).

#### **D. CONCLUSIONS AND SUGGESTIONS**

Based on the results of research and development that has been carried out at Al-Azhar Kindergarten in Langsa City, it can be concluded that interactive media “*fruit game’s*” To improve the cognitive development of early childhood, several conclusions were obtained, developed using the Research and Development method with the ADDIE model which includes the stages of analysis, design, development, implementation, and evaluation, and designed using aspects of visual appearance, navigation, materials, and feedback. Media in Learning activities show that children are more active, enthusiastic, and experience increased abilities in recognizing types of fruit, counting the number of fruits simply, and sorting fruits by size, so that the media “*fruit game’s*” effective in improving children's cognitive development through play-while-learning activities.

Thus, the following suggestions are made: (1) PAUD teachers are advised to utilize interactive learning media such as educational games. “*fruit game’s*” as an alternative innovative media to increase children's involvement and cognitive development; (2) to schools, it is recommended to provide digital-based learning support facilities and infrastructure so that the use of interactive media can be implemented optimally; (3) to future researchers, it is recommended to develop similar media with a wider variety of materials and conduct trials on larger subjects to obtain more comprehensive results; and (4) to parents, it is recommended to utilize educational game media wisely at home as a form of further stimulation for children's cognitive development while still providing support.

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