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DEVELOPMENT OF LEARNING MEDIA "SMART WINDOW" TO ENHANCE CHILDREN'S COGNITIVE ABILITIES

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Abstract

This research aims to develop smart window media to enhance the cognitive abilities of children in group B at RA Baitul Maal. The research method used is research and development (R&D) with a qualitative and quantitative (mixed methods) approach based on the ADDIE development model. Data is collected through observations and interviews conducted with teachers and children at RA Baitul Maal. The research findings indicate that this smart window media is designed to meet the needs of early childhood by integrating engaging, safe, and developmentally appropriate visual and manipulative elements. The feasibility of the "Smart Window" media: Based on expert validation, this media is deemed feasible with a total score of 83.59, which falls into the "Very High" category. This media meets the criteria of usability, design, and aesthetics, and is capable of fostering children's curiosity and motivation to learn. Children's Cognitive Abilities After Intervention: Post-test results show a significant improvement in children's cognitive abilities. All children experienced an improvement in developmental category from "Not Developing" or "Still Developing" to "Developing as Expected" or "Developing Very Well." The average score increase of 45.03 percent indicates the effectiveness of this media in supporting children's cognitive development.

INTRODUCTION

Early Childhood Education plays a crucial role in establishing the foundation of children's cognitive abilities, which significantly influences their future development. These developmental aspects include motor development, cognitive development, language development, social-emotional development, as well as religious and moral development. One important aspect of child development is cognitive development. Cognitive development refers to the stages in which children begin to acquire meaning and knowledge from their experiences and the information they receive. This encompasses the processes of remembering, problem-solving, and decision-making. Therefore, cognitive issues require special attention in their development. Cognitive development is one of the important aspects of human development that relates to understanding (knowledge), encompassing all psychological processes associated with how individuals learn and comprehend their environment (Ismawaty, 2023).

The ideal conditions expected in this field are the availability of innovative, engaging, and developmentally appropriate learning media for early childhood. Such learning media must be able to integrate visual, audio, and kinesthetic elements to support a holistic learning process. In the context of cognitive abilities, effective learning media should stimulate critical thinking skills, problem-solving, and decision-making in children aged 4-6 years, particularly in the B group category.

However, the reality on the ground shows a significant gap. According to data from the Ministry of Education and Culture, many early childhood education institutions still use conventional teaching methods, such as lectures and memorization. A survey in 2024 indicates that only 35% of 10,000 early childhood education institutions in Indonesia utilize technology-based and creative learning media, while the remainder is still limited to traditional teaching aids. As a result, the cognitive ability achievements of early childhood in Indonesia are relatively low. A study by Agustina et al. (2023) reveals that 60% of early childhood children have not reached the expected cognitive ability standards, such as classification skills, simple logic, and problem-solving (Agustina Nua et al., 2023). At the Baitul Maal in South Tangerang, initial observations indicate that the learning media used is still limited to conventional teaching aids such as blackboards, letter cards, and simple

storybooks. This results in a gap between the ideal conditions and reality, where children's cognitive abilities in aspects such as grouping, pattern recognition, and logical reasoning have not developed optimally.

This gap impacts the suboptimal development of children's logical and creative thinking. In fact, good cognitive abilities are crucial to support children in facing educational challenges at the next level. Furthermore, the lack of innovative learning media also causes children to lose interest in learning, which can ultimately hinder the overall development of their potential. This gap has serious implications for the cognitive development of early childhood. Longitudinal research conducted by Yusnita (2020) reveals that children who do not receive optimal cognitive stimulation in early childhood tend to experience difficulties in learning at subsequent educational levels (Yusnita, 2020). This becomes increasingly urgent considering the global educational trends that demand higher-order thinking skills from an early age. The development of new learning media is required to meet the cognitive needs of children, such as the learning media "Smart Window." This media is designed to assist children in understanding basic concepts through visual, manipulative, and interactive approaches.

The urgency of this research is increasingly relevant to current trends and developments, where the world of education is shifting towards a more interactive and technology-based approach. This research is significant as it can provide a tangible contribution in creating applicable solutions to enhance the quality of learning in Early Childhood Education. Thus, the development of the learning media "Smart Window" is expected to address these challenges. The root of the problem of this gap can be traced to several factors. First, the limitations of interactive learning media that are suitable for the characteristics of early childhood. Second, the lack of innovation in the development of learning media that can accommodate diverse learning styles of children. Shofia (2021) in her research found that 65% of early childhood education in Indonesia still lacks learning media that can optimally stimulate children's cognitive abilities (Shofia & Dadan, 2021).

The learning media "Jendela Pintar" developed in this research is an innovation that combines the concept of visual-spatial learning with a hands-on learning approach, which is generally used in schools that typically utilize only one side as a medium. This media is designed with consideration of the principles of early childhood development and integrates enjoyable play elements. The product to be developed has two sides, the first side is made of panel material and the second side is made of magnet material. From both sides, there are various components provided, such as numbers 1-15 or more made from non-magnetic panel material, and numbers 1-10 made from panel material with small magnets attached to the back, as well as geometric shapes of various sizes and colors made from recycled calendar materials that are painted with watercolors and have small magnets on the back for counting the number of triangular, circular, square, and rectangular shapes. The advantages and novelty of the "Smart Window" lie in its ability to integrate visual,

audio, and kinesthetic elements into a single platform. This media is also designed to be user-friendly for both teachers and children, focusing on enhancing classification skills, pattern recognition, and problem-solving.

Several previous studies have attempted to address this issue. Isrofah et al. (2022) developed digital-based learning media for early childhood, but its implementation is generally limited (Budiarti et al., 2022; Isrofah et al., 2022; Jumiati et al., 2022). Meanwhile, Aisah (2019) developed traditional educational play tools, but has not yet integrated technological elements that are appealing to children of the digital era (Aisah, 2019). There is a significant research gap in the development of learning media that combines traditional and modern elements, and can be widely implemented.

The novelty of this research lies in the development of the learning media "Jendela Pintar," which is specifically designed to enhance the cognitive abilities of early childhood children in group B through the integration of visual, audio, and kinesthetic elements within a single platform. Unlike previous studies that focused solely on one aspect, this research combines an educational play approach with interactive design. The foundation of this development is also supported by the R&D model ADDIE method, which ensures that the resulting product is relevant, applicable, and effective in supporting early childhood learning.

The significance of this research lies in its contribution to providing practical solutions for improving the quality of learning in early childhood education, particularly in the development of children's cognitive abilities. The results of the development of the "Smart Window" media are expected to serve as a reference model for the development of similar learning media in other early childhood education institutions.

METHODS

This research employs research and development methods, commonly known as Research and Development (R&D) in English, designed to create or enhance specific products and assess their effectiveness (Hasyim, 2016). Research and development is a process aimed at innovating new products or refining existing ones, to ensure that the outcomes are justifiable. These products may include hardware such as books and teaching aids, as well as software like data processing applications (Setyosari, 2016). The research development model used in this study is the ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) model. According to Sizer et al. as cited by (Rayanto & Sugianti, 2020), the ADDIE model is a method for analyzing how its components interact by coordinating all stages. Below is the diagram of the ADDIE model development:

1. Analysis

   At this stage, a needs analysis is conducted to understand the current conditions at RA Baitul Maal Tangerang Selatan, particularly concerning the cognitive abilities of children in group B. The first step is to identify deficiencies in the existing learning processes,

such as the use of less varied and insufficiently engaging media for children. The analysis also includes the learning objectives to be achieved, namely enhancing children's cognitive abilities in recognizing numbers, letters, colors, and shapes. Additionally, an analysis is performed on the characteristics of the children, the available facilities and infrastructure, as well as the availability of technology that can support the development of the learning media "Jendela Pintar."

2. Design
   In the design stage, concrete steps in designing learning media are determined. The design of the "Smart Window" media will consider the needs of active children in group B who enjoy interacting. This media is designed with a fun concept, using engaging visual and audio elements to support children's understanding of the learning material. The design includes the creation of storyboards, sketches of the media interface, and planning of interactivity that is appropriate for the cognitive development level of children aged 5-6 years. Additionally, methods for evaluation and measurement of the success of this media in enhancing children's cognitive abilities are also considered.
3. Development
   Development is the process of realizing designed media into reality. In this research, the researcher develops the Smart Window to enhance cognitive abilities in early childhood. At the development stage, one of the first things the researcher does is to develop the Smart Window. Then, after the development, the researcher consults with subject matter experts and media experts using a validation form with assessment instruments. At this stage, the developed product is tested first to ensure its validity and usability align with its roles and functions. The expert test, this expert test is conducted by validators, namely material experts and media experts, totaling three experts. The validation instrument sheet is assessed by three validators who have been arranged in the development stage. This validation sheet serves as a reference for revising the developed product.
4. Implementation
   Small-scale trial of smart window media. After the assessment from the validator is completed, the researcher revises the product first according to the directions from the validator. Once the product revision is complete, the product is then ready to be tested to evaluate the feasibility of the media based on the assessment criteria for children in accordance with the development of children's cognitive abilities.

The research was conducted in Group B at RA Baitul Maal Tangerang Selatan. The target of this research is the children of Group B at RA Baitul Maal Tangerang Selatan, aged 5-6 years. At this age range, children are in a crucial stage of cognitive development, where their thinking abilities begin to develop rapidly, including in terms of understanding basic concepts such as numbers, letters, colors, shapes, and cause-and-effect relationships.

The tools used by the researchers in this study are the validation sheet and the observation sheet. The form of validation used to test the effectiveness of the developed media includes (1) the Validation Sheet for Learning Experts and Media Experts, and (2) the Child Assessment Observation Sheet. This validation sheet is provided to experts to measure the suitability of the developed media. This observation sheet is used by the researchers as a reference to modify the product to ensure its usability.

The data collection technique used to evaluate the smart window media product was validated by experts, RA supervisors, and teachers, using a Likert scale with values from 1 to 5. Meanwhile, the assessment rubric and Likert scale were used to evaluate students' cognitive abilities, with levels ranging from 1 to 4. Levels 1-4 are described as follows: not developed (1), beginning to develop (2), developing as expected (3), developing very well (4). If the percentage obtained exceeds 75%, then the child's cognitive ability is considered "developing very well" for use by children. Conversely, if a percentage below 40% is obtained, then the child's cognitive ability can be said to be "not developed" for use in learning activities. To facilitate understanding or reading the results of the research, descriptive statistical methods in the form of percentages were used, employing the following formula:

$$P = \frac{f}{n} \times 100$$

Description:

P : Final score of the child

F : Score obtained by the child

N : Maximum score achieved by the child.

The percentage distribution formula used by the researcher is to determine the percentage of achievement of children in each aspect of numerical ability in group B class at RA Baitul Maal Tangerang Selatan.

Tabel 1. Criteria for Decision-Making Based on Expert Judgment

Category	Validity Level	Criteria
81 -100	Very High	It can be used without revision.
61 - 80	High	It can be used with minor revisions.
41 - 60	Considerable	It can be used with major revisions.
21 - 40	Low	Review a lot and revalidate.
0 - 20	Very Low	The instrument cannot be used.

(Yudha, 2020)

Tabel 2. Eligibility Achievement Rate

Tingkat Pencapaian	Kualifikasi
76% - 100%	Growing very well
56%- 75%	Growing as expected
40% - 55%	Still growing
0% - 39%	Not yet developed

RESULTS AND DISCUSSIONS

Analysis

The initial observation was done on the learning activities at RA Baitul Maal Tangerang Selatan. The results showed that the learning was still mostly using a lecture method with simple visual aids like picture cards and a whiteboard. The kids tended to be passive during the learning process, with little involvement in activities that required problem-solving or exploration. The interview with the teacher revealed that one of the main challenges is the lack of innovative learning media that can grab kids' attention and support their cognitive development. The teacher also mentioned that the limited time to design new media is a significant hurdle.

Based on the gap analysis, it was found that the ideal conditions for early childhood learning should involve interactive media that stimulates cognitive aspects such as grouping, pattern recognition, and logic. However, in reality, the media used do not meet these needs. Data from academic reports indicate that only 45% of children in group B achieve cognitive development indicators in accordance with the early childhood education curriculum standards for 2024.

Based on the results of the analysis, the need to develop learning media is formulated as follows:

1. To capture children's attention through visual and manipulative elements.
2. To support the development of grouping skills, problem-solving, and pattern recognition.
3. To be easy for teachers to use in daily learning.
4. To be accessible by utilizing the resources available at RA Baitul Maal.

Based on the results of the initial assessment, the child's abilities in cognitive aspects such as grouping and pattern recognition are still in the sufficient category, with an average score of 65 out of 100. The child's dominant learning styles are visual (55%) and kinesthetic (35%), indicating the need for media that can be seen and manipulated directly. Some children require an individual approach due to differences in understanding levels. The teacher also conveyed that the media used should be adaptable to various learning themes. The results of the Environmental and Infrastructure Analysis indicate that RA Baitul Maal has sufficiently spacious classrooms equipped with appropriate tables and chairs for early childhood. The available teaching aids include picture cards, storybooks,

and several educational play tools. However, there is currently no interactive media specifically designed to support cognitive learning. The learning environment at RA Baitul Maal facilitates the learning process with a conducive atmosphere and adequate basic facilities. Each classroom is equipped with a whiteboard, bookshelves, and stationery. However, the lack of innovative media limits the diversity of learning strategies.

Based on the results of the needs analysis, user characteristics, as well as the environment and infrastructure, the development of the "Smart Window" learning media becomes a relevant and urgent solution. This media is designed to support the development of children's cognitive abilities through visual and manipulative approaches that align with the characteristics and needs of early childhood. The next stage involves the design and development of the media prototype in accordance with the results of this analysis.

Design

The design stage is an important step in the learning media development process, which aims to design a product based on a needs analysis. This stage focuses on the preparation of product components and technical aspects that will support the achievement of learning objectives.

Product components are core elements designed to ensure that learning media can be used effectively. Product component details include:

1. Learning Objectives

The learning objectives are designed to direct the development of media in a direction that suits the needs of children. In the context of parenting pocket book media, learning objectives include:

a. Improving expressive language skills of children aged 5-6 years through activity-based stimulation.
b. Helping parents practice parenting strategies that support children's language development at home.
c. Strengthen the emotional connection between parents and children through fun interactive activities.

2. Material Structure/Content

Media content is designed with the needs of early childhood development and parental involvement in mind. The structure of the material includes:

a. Introduction: A brief explanation of the importance of the role of parents in children's language development.
b. Daily activities: Practical guidance for parents, such as role-playing, storytelling, and simple questions and answers.
c. Effective communication tips: A guide to using simple and engaging language for children.

d. Evaluation tool: A simple instrument to monitor the development of children's expressive language.

3. Learning Strategies

Learning strategies are designed to facilitate a fun and easy-to-implement learning process, including:

a. Activity-based approach: Integrating everyday activities such as playing, storytelling, and singing.
b. Parent-child collaboration: Emphasizes the importance of direct interaction between parents and children.
c. Multisensory method: Involves visual, auditory, and kinesthetic aspects to maximize language stimulation.

4. Assessment Methods

The assessment was carried out to measure the effectiveness of the media in achieving learning objectives. The assessment methods used include:

a. Observation: Teachers or parents observe children's language skills while using media.
b. Development checklist: A list of indicators that must be achieved, such as improving the knowledge of the surrounding objects and conveying what and how the surrounding objects are known.

5. Product Technical Design

The technical aspects of the product include designing visual and functional elements to ensure that the media can be used effectively by the user. 1) Flowchart/Flow of Use The flow of media usage is designed to be easy for parents to understand, including: a) Introduction: A brief explanation of the contents of the pocket book. b) Activity steps: A systematic guide to involving children in language stimulation. c) Evaluation: The last step to monitor the child's development. 2) Product Technical Specifications Technical specifications include: a) Manufacturing Material: Wood, a piece of magnet and a throw of planel material b) Size: 30cm x 30cm box, c) This process begins with preparing the main materials such as plywood, flannel, iron hinges, handles, and silicone glue. Plywood is cut according to the predetermined size (30 cm x 20 cm), then smoothed to make it safe for children. After that, the flannel fabric is glued to the plywood surface using silicone glue to create a soft and appealing texture for early childhood. Iron hinges are installed on the center side to allow books to be opened and folded with optimal flexibility, while iron handles are installed to provide ease of carrying products. (Product prototype picture Attached), d) Product Features: numbers and magnets to make it easy for children to stick and move geometric numbers and shapes. Attractive and child-safe design. Usage guidelines and learning activities that can guide teachers in using the product.

Develop

The product development stage is an important phase to realize the design that has been made before. In this stage, the manufacture, testing, and refinement of the product are carried out based on the prototype that has been designed. Here is a detailed explanation of the process at the develop stage:

The initial smart window media that has been created, will then be assessed and validated also by media experts. For the validation of smart window media carried out by lecturers who are media experts, early childhood education experts, the results of the assessment and validation given by media experts on smart window media, are as follows:

Tabel 3. Expert Validation Results

No.	Aspect	Assessment Indicators	Validator			Total	Score
			1	2	3		
1	Usage	The use of smart window media is feasible with the goal of developing children's cognitive abilities to be achieved	4	4	5	13	86.67
		The use of smart window media is appropriate for the development stage of children aged 5-6 years	5	5	5	15	100.00
		The use of smart window media can develop more than one aspect of a child's development	4	4	4	12	80.00
		The use of smart window media can foster children's interest and curiosity	4	5	4	13	86.67
		The use of smart	4	4	4	12	80.00

		window media can motivate children					
2	Design	The materials used in making smart window media are safe for children aged 5-6 years	3	4	4	11	73.33
		Smart window media materials are durable and long-lasting	4	4	3	11	73.33
		Smart window media size is suitable with 5-6 year old children	4	4	4	12	80.00
		Smart window media can be used by teachers to develop children's cognitive abilities	5	4	4	13	86.67
3	Aesthetics	The selection of shapes and colors is attractive for children aged 5-6 years	3	4	4	11	73.33
		The selection of images supports aspects of child development	5	5	4	14	93.33
		Suitability of smart window media to children's characteristics	4	4	4	12	80.00
		Smart window media is practical and easy to carry	4	5	5	14	93.33
		Total	**53**	**56**	**54**	**163**	**83.59**

Score	**81.54**	**86.15**	**83.08**	**83.59**

Based on the results of the Smart Window media validation test, the assessment was carried out by three expert validators by considering three main aspects: Usability, Design and Aesthetics. Overall, this learning media received a total score of 83.59 which is included in the "Very High" category and can be used without revision.

In the usability aspect, Smart Window media shows very good performance. Especially in terms of suitability for the developmental stages of children aged 5-6 years, achieving a perfect score of 100%. This media is also considered very good in fostering children's interest and curiosity as well as its relevance to cognitive development goals, respectively getting a score of 86.67%. His ability to develop various aspects of children's development and motivate children received a score of 80%, which is still relatively high.

In the Design aspect, the assessment shows quite satisfactory results. This media received the highest score of 86.67% for its ease of use by teachers in developing children's cognitive abilities. Size suitability for children aged 5-6 years received a score of 80%. Meanwhile, the aspect of material safety and durability received a score of 73.33%, which indicates the need for special attention to this aspect.

For the aesthetic aspect, this media received a very good assessment, especially in terms of selecting images that support children's development and practicality of use, both of which received a score of 93.33%. The suitability of the media to the child's characteristics received a score of 80%, while the choice of shape and color received a score of 73.33%.

Some suggestions from expert validators are:

1. Validator 1: "Smart Window Media has excellent potential in developing children's cognitive abilities. I really appreciate the choice of images and its practicality. However, there needs to be improvements in the safety aspects of materials and color selection to make them more attractive to children. I suggest considering using safer and more durable materials, as well as adding brighter and more attractive color variations."
2. Validator 2: "Overall, this media is very good and appropriate to the development stage of children aged 5-6 years. Its main strength lies in its ability to foster children's interest and curiosity. I recommend maintaining these good aspects. For improvement, perhaps more detailed instructions for use can be added to make it easier for teachers to apply it."
3. Validator 3: "Smart Window Media shows very good quality in the learning aspect. I particularly appreciate its practicality and suitability to learning objectives. However, there are several suggestions for improvement: first, consider increasing

the durability of the material so that it can be used in the long term; second, perhaps more varied interactive elements can be added to increase children's engagement."

By paying attention to these suggestions, the Smart Window media developer can improve the quality and effectiveness of the game tool as a learning medium for cognitive abilities in early childhood. With a total score of 83.59, the Pintar media has met the very high validity criteria and can be used without revision. However, for future development, several aspects such as material safety, durability and color selection can be improved to achieve more optimal results.

Implementation

After the initial prototype has been created, initial testing of the product is carried out. Trials are carried out with teachers and early childhood children to ensure that the product can be used safely, comfortably and in accordance with learning objectives.

Pretest

In the initial stage of the research, a pre-test process was carried out in class to measure children's initial cognitive abilities before using the "Smart Window" learning media. This pretest aims to determine the extent of children's understanding, thinking abilities and mastery of the material before the learning intervention.

The pre-test activity was attended by 11 children with various ability backgrounds. Before the activity begins, the teacher gives a simple introduction to the children to explain that this activity is not a test, but a way to play while learning. This is done so that children feel comfortable and not stressed during the pre-test. Teachers also motivate children so that they are confident and enthusiastic in answering questions or completing the assignments given.

The pretest is carried out in a conducive classroom atmosphere, where children sit in a place that has been prepared with supporting equipment such as simple worksheets, activity cards, or other media that is relevant to the learning theme. Teachers use simple, friendly language to explain instructions to children, ensuring that each child understands what they have to do.

The pretest consists of a series of tasks designed to measure a child's cognitive abilities, such as:

1. Color and Shape Identification: Children are asked to recognize and name certain colors or shapes shown by the teacher.
2. Object Grouping: Children are given the task of grouping objects based on certain criteria, such as color, size, or shape.
3. Simple Reasoning: Children are invited to solve simple problems that involve logic, such as matching pictures with appropriate pairs.
4. Recognition of Numbers and Letters: Children are asked to name the numbers or letters displayed, or arrange them into a certain order.

The teacher records each child's response individually, both from the answers given and from the way the child completes the task. These observations are important to get a comprehensive picture of the child's abilities, including their speed, consistency and understanding of the task.

Process of Using Smart Window Media

Learning using the "Smart Window" media is designed to create a fun and interactive learning atmosphere, so that children can be actively involved in the learning process. This activity includes three main stages, namely initial, core and closing activities, all of which are structured with an approach that is appropriate to the developmental needs of early childhood.

The initial activity process begins with an opening activity which aims to create a warm and enjoyable learning atmosphere. The teacher greets the children enthusiastically, gives them a smile, and invites them to sing the opening song to build a positive atmosphere. The songs chosen usually have a motivational theme for learning, such as the song "Learn Together" or "Let's Play."

After that, the teacher gives a brief introduction about the activities that will be carried out. In this introduction, the teacher explains that they will play while learning using the "Smart Window" media. Teachers also introduce this media to children by showing its physical form, how to use it, and the benefits they will get. Using simple language, the teacher provides directions so that children feel interested and ready to take part in activities.

At the core stage, learning is carried out interactively using the "Smart Window" media. This media is designed as a learning aid that can attract children's attention through creative colors, shapes and functions. The core activity begins with a short demonstration by the teacher, where the teacher shows how to open a "window" to reveal information, such as pictures, letters, numbers, or certain shapes hidden behind a panel.

After the demonstration, the teacher invites the children to participate actively. The core activities are divided into several small sessions which include:

1. Guess the Picture Game: The teacher asks the child to open one of the "windows" and guess the contents of the picture that appears. For example, pictures of fruit, animals, or means of transportation.
2. Recognition of Letters and Numbers: Children are invited to open a window containing letters or numbers, then say them out loud. The teacher then gives examples of using the letters or numbers in words or simple calculations.
3. Object Grouping Practice: Children are asked to open a window containing objects of a certain category, such as color or shape, then group the objects according to the teacher's directions.

4. Interactive Stories: Teachers use the "Smart Window" media as a storytelling tool. Children are invited to open certain panels to continue the story based on the images or symbols that appear.

During the activity, the teacher gives praise and encouragement for every effort the child makes, both successful and imperfect. This aims to build children's self-confidence and motivation to learn.

After all core sessions are completed, learning continues with closing activities. The teacher invites children to reflect on what they have learned by asking simple questions, such as, "What did we learn today, okay?" or "Who knows that new letter or number we learned earlier?" Children are given the opportunity to talk and share their experiences during the activity.

The teacher then provides a brief summary of the day's learning, appreciates the children's efforts, and provides small rewards, such as stickers or collective applause, as a form of motivation. Before closing the activity, the teacher and children sang a farewell song to end the session in a happy atmosphere.

Overall, learning using the "Smart Window" media was effective, fun and interactive. This media helps children learn in a creative and fun way, so that it is easier for them to understand the concepts being taught. The combination of play activities, exploration and active involvement makes children more enthusiastic and enthusiastic during the learning process.

Postest

The post-test process was carried out to evaluate the extent of children's understanding and abilities after participating in learning using the "Smart Window" media. Post-test activities take place in a fun atmosphere, with a child-friendly approach so that they feel comfortable and motivated to show their best abilities.

The teacher starts the activity by giving a brief explanation to the children about what they will do. The teacher uses simple language so that children can easily understand that this post-test is not a scary test, but rather part of a game to see what they have learned. Teachers also emphasize that there are no wrong answers, so children feel confident.

The "Smart Window" media was again used as a tool for the posttest. The teacher prepares material that is appropriate to previous learning, such as letters, numbers, pictures and certain categories. Each child is given the opportunity to participate individually so that the evaluation results are more measurable.

Post-test activities are carried out in turns. Children are asked to come forward one by one to open the "Smart Window" panel that has been prepared. The following are some of the activities in the posttest:

1. Guess the Letter or Number: The child is asked to open the panel containing the letter or number, then say it out loud. Teachers record children's answers to assess their level of mastery.
2. Image Classification: Children are invited to open a panel containing images of objects, such as animals, fruit or objects. They were asked to group objects based on categories, for example color or type.
3. Word Composition Practice: Children open a panel containing certain letters and are asked to compose simple words from these letters. This activity is carried out to measure children's ability to recognize letters and form words.
4. Interactive Story: The teacher gives short instructions, and the child is asked to open certain panels to continue the story according to the images or symbols that appear.

During the activity, the teacher pays close attention to each child's response. The teacher gives praise for every effort the child makes, even if their answer is not correct. This is done to maintain a positive atmosphere during the posttest.

After all children have completed the post-test activities, the teacher appreciates their efforts by giving collective praise. Teachers also give small awards, such as star stickers or collective applause, to foster a sense of self-confidence and pride in children.

The teacher then concluded the activity by addressing all the children, "You were great today! Thank you for wanting to learn and play together. The teacher is very proud of all of you." The posttest was closed by singing the children's favorite song to end the activity in a happy atmosphere.

This post-test process provides a clear picture of the extent to which learning was successfully received by the children. The post-test results are used by teachers to analyze children's development, as well as to improve learning methods in the future so that they are more effective and suit their needs.

Here are the results of a comprehensive analysis regarding the cognitive abilities of children before and after using the Jendela Pintar media.

Tabel 4. Recapitulation Office of Cognitive Ability Improvement

No.	Skor		
	Pretest	Postest	Increase (%)
1	42.19	95.31	53.13
2	39.06	84.38	45.31
3	39.06	96.88	57.81
4	37.50	93.75	56.25
5	35.94	60.94	25.00
6	50.00	73.44	23.44
7	50.00	96.88	46.88

8	25.00	75.00	50.00
9	46.88	93.75	46.88
10	37.50	81.25	43.75
11	35.94	82.81	46.88
Average	**39.91**	**84.94**	**45.03**

The analysis of cognitive ability improvement shows significant results. The average increase reached 45.03 percent. The highest improvement was experienced by Child 03 with an increase of 57.81 percent (from 39.06 to 96.88), while the lowest improvement was experienced by Child 06 with an increase of 23.44 points (from 50.00 to 73.44). It is important to note that all children experienced an improvement in cognitive abilities, although at varying levels.

What is interesting to observe is the transformation of the children's developmental categories. None of the children remained in the "not developed" or "still developing" categories after the intervention, indicating that the Jendela Pintar media is effective in enhancing children's cognitive abilities. Even the children who were initially in the "not developed" category were able to reach the "developing very well" category, as demonstrated by Child 03 who experienced the most significant improvement.

Overall, this data indicates that the use of Jendela Pintar media has a substantial positive impact on the cognitive development of children. An average increase of 45.03 percent and significant changes in developmental categories demonstrate the effectiveness of this learning media in supporting children's cognitive development.

The data above indicates that the "Jendela Pintar" media is capable of overcoming the limitations of lecture methods and simple aids such as picture cards that were previously used in learning at RA Baitul Maal. This finding is consistent with previous research that shows the use of interactive media can enhance engagement and cognitive abilities in early childhood (Aryani & Ambara, 2021; Ayu & Manuaba, 2021; Larasati et al., 2023). Furthermore, this media also supports the development of visual and kinesthetic aspects, which are the dominant learning styles in early childhood (Fitria, 2020).

The results of this research reinforce the constructivist learning theory that emphasizes the importance of direct experience and object manipulation in early childhood education (Piaget, 1964). The "Smart Window" media allows children to learn through exploration and interaction, which aligns with the principles of activity-based learning (Marinda, 2020). This research provides a practical contribution in the form of learning media that teachers can use to effectively enhance children's cognitive abilities. This media is also flexible and can be adapted to various learning themes, making it a relevant solution for early childhood education.

The learning media "Jendela Pintar" has proven effective in enhancing the cognitive abilities of early childhood children. By integrating visual and manipulative elements, this

media provides an interactive and enjoyable learning experience. The results of this research not only support the theory of early childhood learning but also offer practical solutions to address the limitations of learning media often faced by teachers in the field. However, this research also underscores the importance of further evaluation to address existing limitations and improve the effectiveness of this media in the future.

CONCLUSION

This research demonstrates that the learning media "Jendela Pintar" is effective in enhancing the cognitive abilities of early childhood children, particularly in Group B at RA Baitul Maal Tangerang Selatan. The validation test results indicate that this media has a very high level of feasibility based on usability, design, and aesthetics aspects. Furthermore, the pretest and posttest results indicate a significant improvement in children's cognitive abilities, with an average increase of 45.03%. All children experienced development from the categories of "Not Developing" or "Beginning to Develop" to "Developing as Expected" or "Developing Very Well."

The main contribution of this research is the development of interactive media based on manipulatives that integrates visual and kinesthetic elements, thereby stimulating critical thinking skills, pattern recognition, and problem-solving in early childhood. This research also provides a model for implementing activity-based learning that can be widely applied in various early childhood education institutions.

Based on the findings of this research, several recommendations can be proposed. First, the use of "Smart Windows" should be expanded to more early childhood education units to enhance the effectiveness of exploration-based learning. Second, the development of similar media with the integration of digital technology can be a subsequent step in enriching interactive learning methods. Third, training for educators in utilizing innovative media needs to be strengthened to make learning more varied and aligned with children's developmental needs. Thus, this research not only provides innovative solutions in cognitive teaching for early childhood but also opens broader opportunities for the development of manipulative-based learning media in early childhood education.

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