


Development of Flash Card Palindrome to Stimulate Critical Thinking Skills in Aged 5-6 Years

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*Dinda Ananta Saputri, Sri Indriani Harianja, Winda Sherly Utami 

¹²³University of Jambi, Indonesia

Corresponding Author: dindaanantasaputri@gmail.com

A B S T R A C T

This study was conducted with the aim of developing a flash card palindrome (FCPM) media as a medium to stimulate critical thinking skills in children aged 5-6 years. The background of this study is due to the low level of higher-order thinking skills in early childhood which is still evident from children's passivity when learning, a learning system that is still dominated by teachers, and the learning media used is less varied. This study uses a Research and Development (R&D) approach with a 4D model that includes the stages of define, design, develop and disseminate. The subjects of this study consisted of teachers and principals in 3 kindergartens in Tambak Sari Village. In addition, data collection techniques used were interviews, documentation and questionnaires. The results of the feasibility test showed that the media obtained a score of 91% from media experts, 82% from material experts and 92% from teachers with a very good category. Limited implementation showed that children were more active in observing patterns, comparing letters and conveying simple reasons in determining palindrome words. These findings also indicate that FCPM is feasible to use and has the potential to stimulate analytical and reflective thinking skills in early childhood.

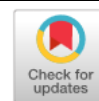
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INTRODUCTION

Education is a lifelong learning effort that positively impacts each individual's growth by providing meaningful and beneficial learning for their future lives (Pristiwanti et al., 2022). Education needs to be provided early through Early Childhood Education (PAUD) institutions with the aim of providing appropriate stimulation so that children are ready to take the next level of education (Sumaya et al., 2024). Permendikbudristek Number 5 of 2022 explains that aspects of child development focus on several aspects such as: religious and moral values, Pancasila values, physical-motor, language, cognitive, and socio-emotional (Hidayat & Nurlatifah, 2023). However, of all these developmental aspects, the most important and important to stimulate from an early age is the cognitive aspect because every child's activity involves their cognitive abilities (Octavia et al., 2025).

Cognitive development refers to mental activities such as thinking, remembering, imagining, problem-solving, and language (Fauzia, 2023). Cognitive abilities are also closely related to an individual's way of thinking, both internally and physically, in solving problems in their environment (Nadlifah, 2022). Cognitive abilities involve various mental activities, one of which is the ability to think (Hasni & Amanda, 2022). Thinking ability is the activity of receiving various information so that a problem can be solved appropriately (Lismaya, 2019). Furthermore, thinking ability also includes a person's ability to process various knowledge and information obtained to reach a truth (Wulandari et al., 2019).

Based on the revised version of Bloom's taxonomy, thinking skills consist of: Lower-Order Thinking Skills (LOTS), Middle-Order Thinking Skills (MOTS), and Higher-Order Thinking Skills (HOTS) (Gunawan & Palupi, 2016). These three skills need to be optimally stimulated from an early age. However, the reality on the ground shows that the abilities of

early childhood are still classified as low-order thinking skills (LOTS), even though their advanced thinking skills also need optimal stimulation. This is more clearly seen in the learning methods used, which are still limited to listening to teacher explanations and instructions (Leuwol et al., 2023). This system leaves children with limited abilities to record and imitate what they hear, and to do everything according to instructions given (Sulaiman, 2020).

The latest PISA survey results also show that Indonesian children's higher-order thinking skills in problem-solving are severely lacking, as evidenced by Indonesia's ranking of 72 out of 78 countries (Rahardian, 2022). Yet, in the 21st century, HOTS thinking skills, including creative, critical, collaborative, and communication (4K) skills, are highly needed and prioritized in daily activities (Harianja, Putri, et al., 2025). Daily activities that indirectly require these 4K skills are useful for supporting the success of a person's activities, one of which is in the world of education. In Indonesia, the education system still adheres to a teacher-centered system, where teachers dominate the classroom during learning. This system prevents the 4K skills needed in this century from developing optimally (Firmansyah & Jiwandono, 2022).

The 4C skills themselves involve various aspects of a child's development, but the most important is critical thinking. Critical thinking is a thinking skill that involves children actively questioning the facts, ideas, and concepts they receive (Harianja, Putri, et al., 2025). Supporting this view, critical thinking not only involves children actively questioning the information they receive, but can also be defined as a thought process involving concept creation and conceptual evaluation (Harefa & Sarumaha, 2020).

Based on the explanation above, critical thinking ability is an ability related to how a person thinks and processes the information they receive so they can solve a problem (Harianja, Putri, et al., 2025). However, critical thinking ability in early childhood itself has a different definition where this ability includes how children process information through observing, analyzing, making assumptions and concluding the information they receive (Amalia et al., 2018). This is also supported by the Regulation of the Minister of Education and Culture No. 137 of 2014 which explains that critical thinking ability in early childhood can be seen from several indicators, namely: children show exploratory and investigative activities, children can solve simple problems encountered in their daily lives, and can identify the causes and effects of problems in their environment (Yusri, 2018).

Previous research by (Rahman & Fuadatun, 2017) (Israwati et al., 2022) found the same problem, where cognitive development in early childhood is still not optimal. This is evidenced by the ability of children who are still unable to solve simple problems they encounter, cannot yet sort objects according to their function and shape, and many children still do not recognize numbers and letters well (Indrayanti et al., 2024). Furthermore, the learning model used is also not optimal, where children still play a role only as listeners.

The results of observations conducted at Kemala Bhayangkari Kindergarten 30, Rumpun Tani Kindergarten, and Sa'adatul Khidmah Islamic Kindergarten showed that many children's critical thinking skills were not yet optimal. This was evident from the number of students at Kemala Bhayangkari Kindergarten (8 children), Rumpun Tani Kindergarten (9 children), and Sa'adatul Khidmah Islamic Kindergarten (8 children). Clear evidence of children whose critical thinking skills had not yet developed was seen from the fact that many children still tended to be passive while learning. More clearly, this was also evident from the fact that many children did not have their own initiative to ask questions, take the initiative to answer questions related to learning, and children were not yet able to conclude the information they received. This problem was also supported by limited facilities and infrastructure, one of which was the provision of adequate learning media. The learning media used in the three kindergartens was still lacking in variety, lacked updates, limited in number, and used conventional, ready-to-use media such as blocks, puzzles, and storybooks.

In response to this problem, a possible solution is to develop a teaching medium in the form of Flash Card Palindromes (FCPM) to stimulate critical thinking skills in children aged 5-6 years. Flash cards themselves are widely known and used by various groups. This learning

medium presents images, numbers, and letters in various sizes to introduce number concepts and early counting concepts through images as symbols (Utami, 2023).

However, existing flash cards do not share the same concept as palindrome flash cards. A palindrome is a word, phrase, verse, or sentence that, when read backward or forward, still has the same sound and meaning (Riderstrom, 2024). Palindromes are not only applied to linguistics but can also be applied to music and mathematics (Yu, 2018). Therefore, the FCPM media was developed, because the palindrome flash card (FCPM) media is a media in the form of a two-sided card that combines images and palindrome words by providing a unique, concrete learning experience and giving children space to think (Harianja, Putri, et al., 2025). This media also aims to stimulate critical thinking skills in early childhood, where it is seen from the media elements in the form of empty boxes that need to be filled according to words included in the palindrome category.

Reflecting on the problems and solutions presented, FCPM is suitable for development as an innovative medium that can stimulate the critical thinking skills of children aged 5-6 years in three kindergartens in Tambak Sari sub-district. Furthermore, this medium also offers the latest efficiency and innovation to stimulate growth and development in children, which need to be continuously optimized from an early age in accordance with modern progress. Therefore, this study has the main objective of developing palindrome flashcard media to stimulate the critical thinking skills of children aged 5-6 years.

METHOD

This study uses a research and development (R&D) approach with a 4D model consisting of four main stages: define, design, develop, and disseminate (Murni, 2025). This model was chosen because of its systematic, structured, and interactive process, making it suitable for developing learning media that can be tailored to children's characteristics and learning objectives. This study aims to develop palindrome flash cards as a learning aid to stimulate critical thinking skills in early childhood based on the assumption that well-designed learning media can increase children's cognitive engagement and high-level thinking processes (Hafifa, 2025).

The subjects of this study were seven teachers and three principals at the Tambak Sari Kindergarten in Kembak Sari Village, including Kemala Bhayangkari 30 Kindergarten, Sa'adatul Khidmah Islamic Kindergarten, and Rumpun Tani Kindergarten. The data collection techniques used in this study were interviews and documentation. (Sugiyono, 2020) stated that interviews are used when the research has identified a problem to be studied and to obtain more in-depth results. The following is the interview guideline sheet used.

No.	Question
1.	What curriculum does the school use?
2.	What learning models and methods do teachers use?
3.	How many teachers teach at the school?
4.	How many students are there at the school?
5.	What is the average age of children accepted into school?
6.	How long does the school spend on learning?
7.	What is the learning process carried out by the school from start to finish?
8.	What learning media and strategies do you use to stimulate your child's critical thinking skills?
9.	How is the development of children's critical thinking skills in your class?
10.	What obstacles do you face in stimulating your child's critical thinking skills?
11.	Do you know Flash Card Palindrome media?
12.	Has your school ever used Palindrome Flash Card media?

In addition, this study also conducted media validation by subject matter experts, media experts, and early childhood education practitioners (teachers) to ensure the feasibility, suitability, and pedagogical relevance of the developed media. Furthermore, this research instrument, consisting of interviews, questionnaires, and documentation, was used to observe and assess the accuracy of the content, design, language suitability, and practicality, as well as its effectiveness in stimulating children's critical thinking skills (Permana, 2025). Expert validators were selected based on their academic background, professional experience, and expertise in learning media development research (Sugiyono, 2020).

Based on the four main stages that have been carried out, the data obtained from the validation results and teacher response questionnaires will be processed and analyzed using quantitative and qualitative data analysis techniques. The quantitative data will be analyzed by calculating the average score obtained from the validation results and teacher response questionnaires. The qualitative data obtained will be analyzed using the analysis according to Miles and Huberman which consists of four stages: data collection, data display, data reduction, and conclusions. Then, a conclusion can be drawn to determine whether the developed media is feasible and successful in stimulating children's critical thinking skills (Qomaruddin & Sa'diyah, 2024).

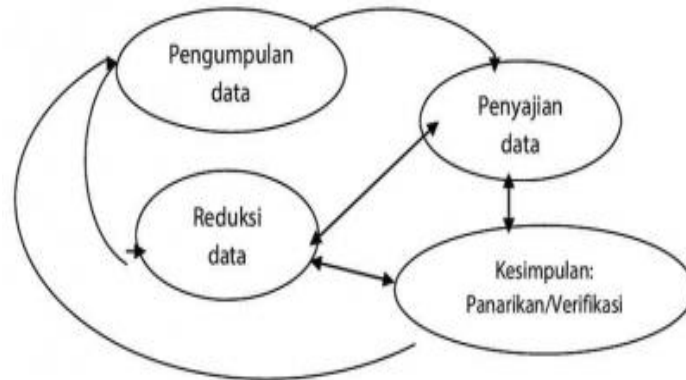


Figure 1. Miles and Huberman's data analysis technique

FINDINGS AND DISCUSSION

The following is a description of the data from the results of interviews and documentation that researchers have conducted by carrying out 4 main stages in the form of identifying needs from the objectives to the limitations that will be used for the development of palindrome flash card media. Identification of needs consists of three things: identification of learning media, learning strategies and analysis of children's critical thinking skills. The implementation began by interviewing 7 teachers and 3 principals at Kemala Bhayangkari 30 Kindergarten, Sa'adatul Khidmah Islamic Kindergarten and Rumpun Tani Kindergarten which began in August 2025 for 2 weeks starting from making letters, requesting permission and conducting interviews.

Define

This stage includes an analysis of needs, student characteristics, curriculum analysis, and an analysis of children's learning problems. Interviews with teachers and principals indicate that the school's teaching methods are still teacher-centered, with children acting as passive recipients of information. Children rarely observe, analyze, compare, and express opinions independently. This situation impacts the development of children's higher-order thinking, particularly critical thinking.

In theory, early childhood cognitive development requires exploratory and contextual stimulation to build active thinking structures through direct experience (Warmansyah et al., 2023). Learning that focuses on verbal instruction and memorization does not provide space for children to develop reflective and analytical thinking (Sulaiman, 2020). This reinforces the urgency of developing learning media that can activate children's mental processes, not simply convey information.

The needs analysis also showed that existing learning media in schools are still conventional, such as blocks, standard puzzles, number cards, and storybooks, without any specific modifications to stimulate children's cognitive abilities. None of the existing media has been specifically designed to stimulate critical thinking skills such as observing patterns, comparing information, identifying cause and effect, and drawing simple conclusions. However, critical thinking in early childhood does not have to be manifested in abstract thinking but can be developed through concrete activities involving exploration, observation, and simple reflection (Wasahua, 2021).

Thus, at this stage, it can be concluded that innovative media that is visual, concrete, interactive, and cognitively challenging, while still being appropriate for children's developmental characteristics, is needed (Harianja et al., 2023). Therefore, flash card palindrome (FCPM) media was developed to address this need. This media contains visual elements, language symbols, and symmetrical patterns that can stimulate children's natural analytical thinking.



Figure 2. Number Flash Card
Figure 4. Puzzle Media



Figure 3. Block Media
Figure 5. Storybook Media

Design

This stage focuses on designing the media structure, content, visuals, and mechanisms for using the media in learning. Palindrome flash cards are designed as two-sided cards containing a combination of images and palindrome words with symmetrical characteristics. Each card is used not only to introduce words but also to stimulate children's thinking skills through activities such as flipping, comparing, observing letter patterns, and arranging each letter into a complete whole.

Pedagogically, the FCPM design adheres to the principles of visual-concrete learning, which emphasize the connection between symbols, images, and children's direct experiences (Safira et al., 2025). Concrete visual representations help children gradually build conceptual understanding from sensory to symbolic meaning. In this context, palindrome patterns present a cognitive challenge because children not only read but also verify the appropriateness of the word order from both sides.

This media design also considers the language and cognitive development of early childhood, where children are in the phase of symbolic thinking moving towards concrete operational thinking (Warmansyah et al., 2023). Therefore, FCPM media is not designed solely for memorization and word recognition, but rather as a medium for exploring language patterns that encourages children to think actively.

Based on a modern-day learning perspective, this media design aligns with strengthening the 4C skills, particularly critical thinking and communication. This is because, through this media, children are encouraged to explain their reasoning, discuss with friends, and express simple opinions (Harianja, Putri, et al., 2025). Thus, the design stage focuses not only on the media's aesthetics but also on stimulating children's cognitive abilities through interaction with the media.



Figure 6. Initial Design



Figure 7. Final Design

Develop

The development phase involved a validation process with media experts, subject matter experts, and early childhood education (PAUD) teachers. Validation results showed that FCPM received a score of 91% from media experts, 82% from subject matter experts, and 92% from teacher responses, categorized as "very good." This data indicates that the FCPM media meets the eligibility standards for visual aspects, pedagogical content, and practicality in the classroom.

Media expert validation confirmed that the FCPM visual design met the principles of readability, symbol clarity, and color appropriateness for early childhood characteristics. This aligns with the principles of learning media design, which emphasize that simple, contrasting, and structured visuals can improve children's focus and understanding (Rachmawati et al., 2025).

Meanwhile, validation by subject matter experts indicates that the FCPM content is relevant to early childhood cognitive development and critical thinking indicators. FCPM not only introduces language concepts but also fosters thought processes through pattern analysis, classification, and information verification. This aligns with the view that meaningful learning occurs when children are actively involved in the process of constructing knowledge, rather than simply receiving information (Sumaya et al., 2024).

Teacher responses indicated that FCPM was easy to use, flexible for application in various learning activities, and able to increase children's active participation. Teachers assessed that children became more active, asked questions, and demonstrated greater curiosity during the learning process. These findings support previous research that suggests interactive visual media can increase students' learning engagement and the quality of their interactions (Israwati et al., 2022)(Harianja, Utami, et al., 2025).

Table 1. Media Expert Validation

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Validation Process	Respondents	Maximum Score	Score	Percentage (%)	Category
Validation	Dr. Indriyani, S.Pd., M.Pd.I.	44	42	95%	Very good
	Asih Nur Ismiatun, M.Pd.	44	38	86%	Very good
Total score					80
Maximum Score					88
Percentage					91%
Category					Very good

Table 2. Results of Material Expert Validation

Process Validation	Respondents	Maximum Score	Score	Percentage (%)	Category
Validation	Rizki Surya Amanda, M.Pd.	36	27	75%	Very good
	Annisa Erdaliametha, M.Pd.	36	32	88%	Very good
Total score					72
Maximum Score					69
Percentage					82%
Category					Very good

Table 3. Teacher Responses

No.	Teacher's Name	Maximum Score	Score	Percentage (%)	Category
1.	YES, S.Pd. AUD	44	44	100	Very good
2.	MW	44	44	100	Very good
3.	RV	44	33	75	Very good
4.	EE, SSPt	44	44	100	Very good
5.	RN	44	38	87	Very good
6.	DT	44	38	87	Very good
7.	OT, S.Pd. Gr.	44	42	93	Very good
8.	RN, S.Pd.	44	43	97	Very good
9.	NN, S.Pd.	44	38	100	Very good
10.	PR, SE	44	44	100	Very good
Total score				407	
Maximum score				440	
Percentage				92%	
Category				Very good	

Disseminate

At this stage, FCPM was implemented on a limited basis in the classroom. Observations showed that children were not only able to recognize palindrome words but also began to demonstrate the development of their analytical processes. Children observed letter patterns, compared sequences, flipped cards for verification, and provided simple reasoning to determine whether a word was a palindrome or not.

This behavior indicates a shift from passive thinking to active thinking. Initially, they were simply remembering, but now they are beginning to engage in simple analysis, evaluation, and reflection. This is theoretically an early sign of the development of critical thinking skills in early childhood (Wasahua, 2021).

Furthermore, changes in children's learning behavior are also evident in increased social-cognitive interactions, such as simple discussions with peers and the courage to express opinions. This demonstrates that FCPM impacts not only cognitive aspects but also other aspects. This process aligns with the view that social interaction-based learning can meaningfully strengthen children's knowledge construction (Warmansyah et al., 2023).

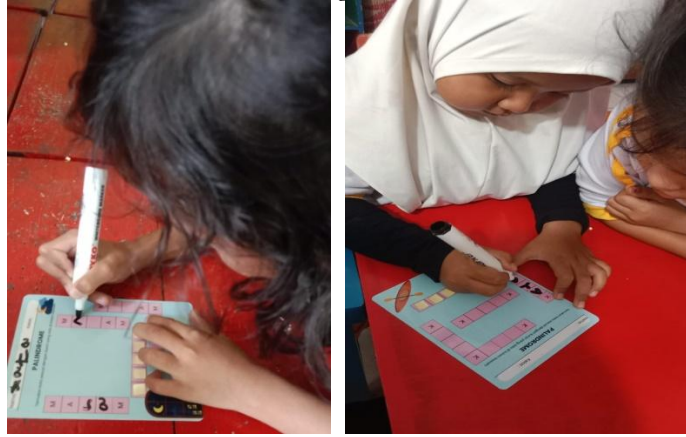


Figure 8. Media Implementation

CONCLUSIONS

Overall, the results show that the development of FCPM media through the 4D model produces media that is pedagogically and visually appropriate, relevant to the characteristics of child development, effectively stimulates all aspects of children, especially their critical thinking skills, and increases children's active participation and learning activity. This media not only functions as a learning aid, but as a cognitive tool that facilitates children's thinking processes systematically, so that FCPM can be positioned as an innovative media that supports the transformation of PAUD learning from an instructional approach to cognitive exploration-based learning. Furthermore, this research has both theoretical and practical implications. Theoretically, FCPM reinforces the view that critical thinking skills in early childhood can be developed through concrete media developed systematically through simple activities such as observation, comparison, and reflection. Furthermore, the practical implication is that FCPM can be used as an alternative learning medium that is innovative, affordable, flexible, and easy to apply to everyday learning.

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