



Unplugged Coding with Traditional Snacks: A Quasi-Experimental Approach to Enhancing Early Childhood Computational Thinking

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ABSTRACT

This study aims to describe the implementation of unplugged coding using traditional snack media to develop computational thinking skills in children aged 5-6 years. The lack of integration of local cultural elements in technology education is the primary background of this study. The research method used was a quantitative quasi-experimental design with a one-group pretest-posttest. Data were analyzed using a paired t-test to assess the significance of differences in children's abilities before and after treatment. The results showed a significant improvement in decomposition, pattern recognition, and simple algorithmic skills after children interacted with traditional snack media. These findings prove that abstract computational concepts can be taught concretely and contextually through local wisdom. This research contributes to the development of early childhood education by providing an innovative model of digital learning without devices (unplugged) while preserving cultural values. Theoretically, these results strengthen the integration of ethnopädagogy into modern educational curricula and provide a foundation for digital literacy from an early age, without dependence on gadgets.



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INTRODUCTION

Early Childhood Education (ECE) in the Era 5.0 faces significant challenges in preparing a generation that is not only proficient in technology but also possesses critical and systematic thinking skills (Usnul et al., 2023). A fundamental competency currently gaining global attention is Computational Thinking (CT) (Salsabila & Yahfizham, 2024). CT is not limited to computer programming skills; instead, it is a cognitive process that involves formulating problems and designing solutions that can be expressed through logical steps or algorithms (Hidayat et al., 2024). Introducing CT to children aged 5–6 years is particularly important because this developmental stage is characterized by extraordinary brain plasticity, where the cognitive foundations for problem-solving begin to form permanently (Sabar et al., 2026). However, the primary challenge in the field is the perception that introducing information technology concepts is invariably linked to excessive screen exposure, which is feared to adversely affect children's socio-emotional development and physical health (Yulianto & Musda, 2025).

To address these concerns, the "unplugged coding" approach has emerged as an effective pedagogical solution. Unplugged coding is a technique for introducing fundamental programming concepts such as algorithms, sequences, decomposition, and pattern recognition, without the use of



digital devices (Rahmawati & Agustin, 2024). Previous research studies have shown that early childhood learners can internalize robotics and programming concepts through physical activities and manipulative play. By engaging in device-free tasks, children are encouraged to develop computational thinking skills through verbal instructions, body movements, or the use of concrete objects (Asiah et al., 2025). This perspective aligns with Jean Piaget's theory of cognitive development, which explains that children in the preoperational stage learn most effectively through direct interaction with tangible objects in their environment (Alfadhilah, 2025). Consequently, unplugged coding bridges the gap between future digital literacy and the concrete, play-based nature of early childhood learning (Adhe et al., 2026).

The relevance of unplugged coding within the ECE curriculum is further reinforced by the argument that basic algorithmic skills can foster children's independence and discipline in completing daily tasks. When children learn to organize sequences of steps to achieve specific goals within a game, they are essentially practicing complex problem-solving strategies (Lestari, 2020). However, the implementation of unplugged coding is often hindered by the use of expensive, mass-produced media that may not be relevant to the child's local cultural context. Many ECE institutions in Indonesia still adopt international modules that feature instructional tools unfamiliar to students, which may diminish learning depth. In contrast, the integration of cultural aspects into Science, Technology, Engineering, and Mathematics (STEM), which has now evolved into STEAM with the addition of Arts, has been proven to enhance student engagement with the instructional material (Mawar et al., 2026).

The disparity between future digital literacy requirements and the limited technological resources in many ECE institutions necessitates creative, contextually grounded instructional innovations. Presenting abstract concepts in contexts closely related to children's daily experiences is important for creating meaningful learning without reliance on expensive digital devices. In this regard, traditional snacks play a significant role as educational tools. Indonesia possesses a rich culinary heritage characterized by a high degree of mathematical and logical elements (Nurkhasanah & Hakim, 2026). Traditional snacks such as *kolak*, *es pisang hijau*, *onde-onde*, *bikang*, and *pukis* feature variations in color, shape, texture, and preparation processes that naturally reflect concepts of pattern recognition and sequencing. Utilizing traditional snacks as media for unplugged coding serves not only as a cognitive aid but also as an effort to introduce and preserve local culture from an early age. As shown in previous research, introducing local culture in early childhood education helps build self-identity and a sense of pride in national heritage (Anggreni & Fachrurrazi, 2025). Concrete media familiar to children's daily lives make abstract computational thinking concepts more accessible, understandable, and engaging (Fitriyah et al., 2023).

While computational thinking (CT) is crucial for early childhood, its practical implementation continues to face significant obstacles. Previous research indicates that many educators remain constrained by the perception that CT is inherently linked to high-plugged computer devices, which are often unavailable across all early childhood education (PAUD) institutions (Salsabila & Yahfizham, 2024). Furthermore, children's low proficiency in systematic problem-solving is frequently associated with the delivery of logical concepts that are overly abstract and lack relevance to their daily lives (Solehudin et al., 2024). The use of mechanistic media that lack emotional engagement and contextual connections to children's everyday environments may lead to reduced learning interest and difficulties in understanding fundamental CT concepts, such as decomposition and pattern recognition (Sehati & Pohan, 2025). Another issue arises from the limited variety of instructional media capable of bridging digital concepts with concrete play activities, resulting in not optimal CT stimulation (Sabar et al., 2026). If these constraints are not promptly addressed through contextual media innovation, children's potential to develop critical reasoning from an early age will be significantly hindered.

Technically, the implementation of unplugged coding through traditional snacks can be executed by designing "roadmap" or "work instruction-sequencing" simulation activities. For instance, an activity may begin with children receiving algorithmic instructions to act as programmers by arranging arrow cards in a sequence from a starting line to a designated snack image box. To assess more complex aspects of computational thinking, teachers may introduce pattern challenges, such as arranging arrow cards in alternating colors. Through this process, children learn decomposition (breaking down large tasks into smaller parts), pattern recognition (identifying similarities among snack types), abstraction (focusing on



relevant information, such as color), and algorithms (the precise sequence of steps) (Grover & Pea, 2013). Furthermore, the use of these media stimulates other developmental aspects, including language skills during instruction delivery and socio-emotional development through collaborative group work.

While research on unplugged coding has begun to expand in Indonesia, most studies remain focused on board games or flashcards. Research specifically exploring the potential of traditional snacks as a stimulant for computational thinking remains very limited. Consequently, a significant literature gap exists regarding the effectiveness of these heritage-based media in enhancing algorithmic understanding among children aged 5–6. Furthermore, many ECE practitioners still perceive coding as a rigid subject that is difficult to implement in schools with limited facilities. Therefore, this study aims to demonstrate that computational thinking stimulation can be conducted and economically while retaining profound pedagogical value through the use of local cultural assets.

The urgency of this research stems from the need to strengthen the learning outcomes of the "Foundation Phase" (*Fase Fondasi*), which encompasses eight developmental domains and the graduate profiles outlined in the national curriculum. The implementation of unplugged coding through traditional snack media is intended to stimulate religious and moral values through the habituation of gratitude for the archipelago's natural wealth, while reinforcing children's self-identity through concrete exposure to local cultural (Yudiati et al., 2024). Significantly, this research addresses the development of civic values by fostering patriotism and pride in local heritage from an early age. Through interactions with traditional snacks, children not only learn to recognize national products but also to respect cultural diversity as part of their Indonesian civic identity. This civic dimension is further strengthened through the stimulation of mathematical logic and scientific thinking in problem-solving (coding), which fosters independence, as well as the development of motor and language skills through teamwork instructions. Moreover, socio-emotional aspects are developed through peer collaboration, while aesthetic appreciation is fostered through exposure to traditional culinary presentations. Thus, this integration ensures that the Foundation Phase graduate profile is not only cognitively and digitally proficient but also characterized by strong civic values, critical reasoning skills, and a commitment to preserving local culture.

Although the introduction of computational thinking (CT) has begun to be integrated into the *Kurikulum Merdeka*, its implementation remains limited, primarily due to an over-reliance on limited digital devices across many early childhood education (PAUD) institutions (Muljono et al., 2024). Current reports on digital literacy among Indonesian children indicate a persistent technology access gap that risks exacerbating cognitive disparities if CT is taught exclusively through plugged-in methods (Kurniawati, 2021). This phenomenon is further compounded by the fact that many educators struggle in contextualizing abstract concepts such as algorithms and decomposition within children's daily lives (Fitriyani et al., 2021). Failure to address this issue may render CT instruction less relevant and, more importantly, distance children from their local cultural heritage. Consequently, research integrating unplugged coding with concrete media, specifically traditional snacks, is essential to bridge the gap between technological literacy requirements and the preservation of cultural identity from an early age (Indriana & Moch, 2024).

By integrating local values, children develop both logical intelligence and environmental awareness (Aminah Manik, 2024). The traditional snack images used are not merely static objects; they also function as storytelling media conveying narratives of mutual cooperation (*gotong royong*), patience, and aesthetics. This approach adds a humanistic dimension to coding education, which is often viewed as mechanistic. Accordingly, unplugged coding, based on traditional snack media, is expected to create a holistic learning ecosystem in which technology (in conceptual form) and culture synergize to shape a child's character development.

This study aims to describe the implementation of unplugged coding using traditional snack media to develop computational thinking skills in children aged 5–6. The primary focus is directed toward children's responses to logical instructions and the extent to which traditional snack media facilitate their understanding of basic algorithmic concepts. The findings are expected to provide practical contributions to ECE teachers in designing creative, innovative, and contextually relevant coding activities, as well as theoretical contributions to the development of ECE curricula that integrate local wisdom and 21st-century skills. Through this approach, it is hoped that the paradigm of coding as



expensive and difficult can shift toward a more accessible, enjoyable, and meaningful learning experience for Indonesian children.

METHOD

This research employs a quantitative approach with a quasi-experimental design, specifically the One-Group Pretest-Posttest Design. This approach was selected to measure the effectiveness of the traditional snack media intervention by comparing the subjects' computational thinking skills before and after the treatment within a natural classroom setting (Kevin et al., 2025). The study involved nine children aged 5–6 years in Grade B, selected through purposive sampling based on their cognitive readiness at the pre-operational stage and consistent attendance, allowing for intensive observation of behavioral shifts in a specific environment. The data collected consist of quantitative scores representing the children's computational thinking (CT) performance. Primary data include pre-test and post-test scores derived from direct observation of children's ability to solve unplugged coding challenges. Additionally, secondary data in the form of activity documentation and work artifacts were gathered to corroborate the numerical findings and provide physical evidence of the children's progress during the intervention.

Data collection was conducted through structured observation and performance tests using a rating scale instrument. The instrument's indicators are specifically designed to measure four dimensions of computational thinking: (1) Decomposition, the ability to break down steps; (2) Pattern Recognition, identifying similarities in snack attributes; (3) Abstraction, focusing on essential information; and (4) Algorithms, the ability to sequence logical instructions on the grid board. Each indicator is scored based on the child's level of task completion and independence. The data analysis technique utilizes both descriptive and inferential statistics. Descriptive analysis is used to compare the mean scores of the pre-test and post-test, while inferential analysis involves a normality test as a prerequisite. Provided the data are normally distributed, a Paired Sample T-Test is performed using SPSS software to determine the significance of the difference between the pre-test and post-test results, thereby testing the research hypothesis. The research procedure followed a systematic flow starting from the initial observation and pre-test, followed by the implementation of unplugged coding sessions using traditional snack media, and concluding with a post-test and data synthesis (Figure 1).

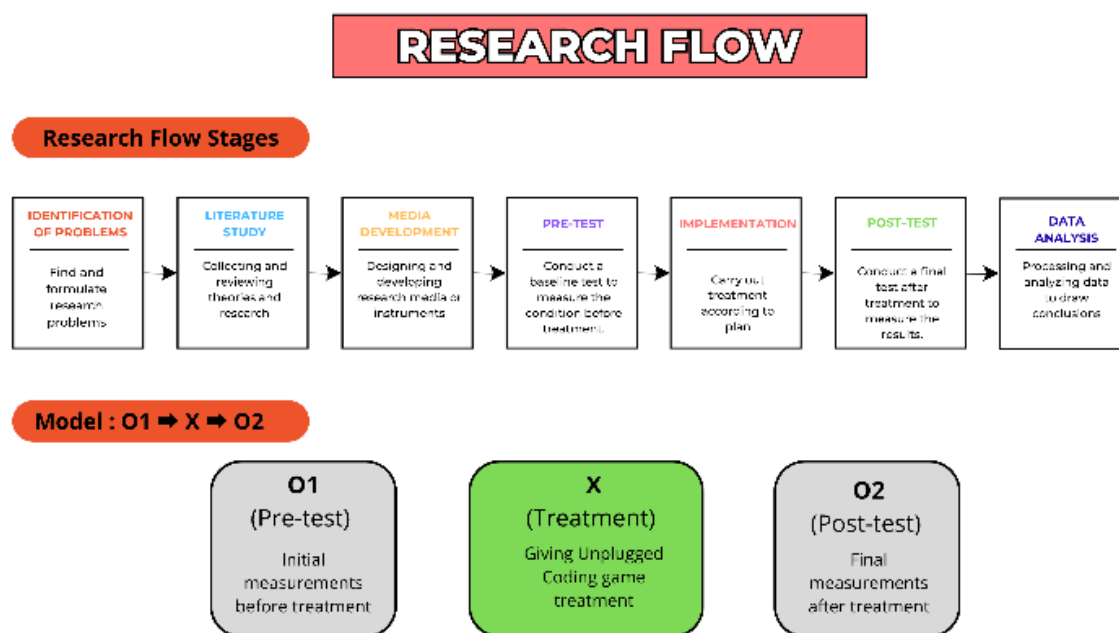


Figure 1. Research Workflow



RESULT AND DISCUSSION

This study aims to determine the effectiveness of implementing unplugged coding via traditional snack media in developing Computational Thinking (CT) skills in children aged 5–6 years. The research data were obtained through structured observations using an assessment instrument covering four primary indicators: decomposition, pattern recognition, abstraction, and algorithms. The research data comprise pre-test scores (O_1), recorded prior to the intervention, and post-test scores (O_2) collected after the subjects participated in five treatment sessions. These sessions utilized grid boards, directional arrow cards, and visual representations of traditional snacks, specifically *kolak pisang*, *pisang ijo*, *lumpia*, and *onde-onde* (Figure 2).

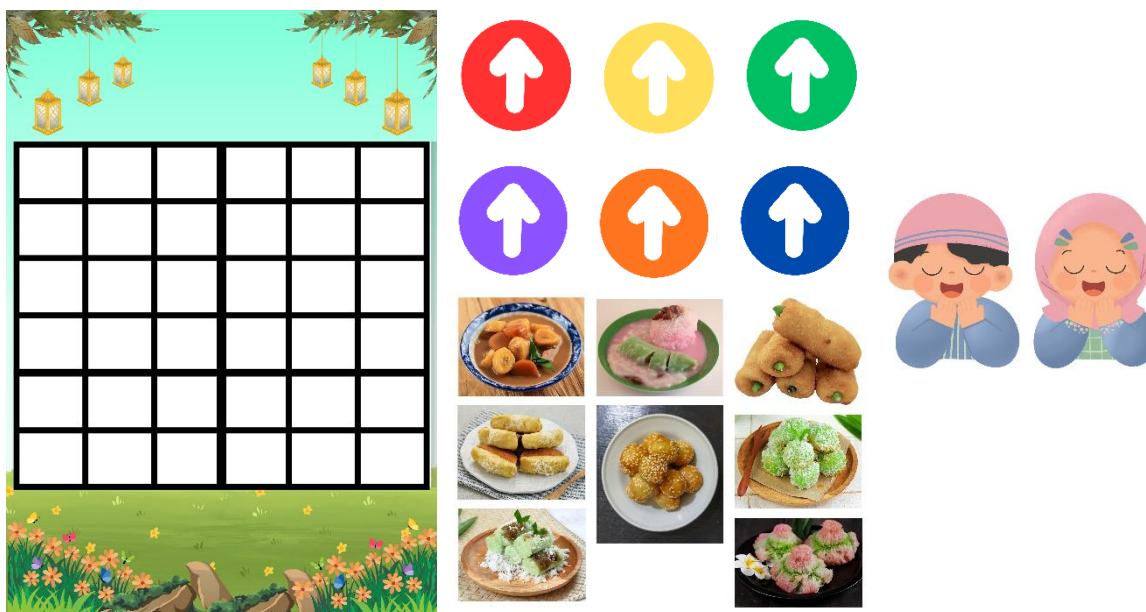


Figure 2. Unplugged Coding Instructional Media

The study commenced with the preparation of instructional instruments for screen-free digital learning. The components of the Educational Teaching Aids (APE) utilized in this intervention are presented in Figure 2, comprising a grid board, colored arrow cards, child profile icons, and visual representations of traditional snacks. Based on the components illustrated in Figure 2, the gameplay procedure was designed to stimulate children's logic incrementally. Initially, children were asked to set a target by selecting two or three types of traditional snacks they intended to "purchase." Subsequently, they chose their preferred starting point by placing a male or female icon at any corner of the grid board (top, bottom, right, or left). Once the starting position was established, children were instructed to use specific colored arrow cards as symbolic directional commands toward the target snacks. To reinforce directional awareness and computational problem-solving, children were required to verbally articulate the sequence of directions they traversed (e.g., "forward, right, forward"). This technical activity aimed to ensure that children did not merely play mechanically but were also capable of independently communicating the algorithms they had constructed. Prior to the intervention, a pre-test was conducted to determine the subjects' baseline abilities. The recapitulation of these initial scores is detailed in Table 1.

Recapitulation of Pre-Test and Post-Test Results

Based on the data presented in Table 1, it is evident that the majority of the children scored at levels 1 and 2, indicating that their computational thinking (CT) skills had not yet developed optimally prior to the intervention. The participants' performance and engagement during the initial pre-test phase are documented in Figure 3.



Table 1. Pre-Test Results of Children's Computational Thinking Skills

Assessment Indicators	Child Name						
	Br	Rf	Zv	Gys	Yr	Rey	Fda
The child is able to identify game components: the starting point (start), the grid path on the board, and the selected traditional snack targets.	2	2	2	2	2	2	2
The child is able to categorize or utilize directional arrow cards based on color consistency (Red, Yellow, Blue, Orange, Purple, or Green) according to specific pattern instructions.	2	2	2	2	2	2	2
The child is able to determine the most effective route toward the target snack image, while disregarding irrelevant images or grid squares that are not designated as targets.	1	1	1	1	1	1	1
The child is able to arrange directional arrow cards sequentially to construct a logical series of movement instructions on the grid board.	1	1	1	1	1	1	1
TOTAL	6	6	6	6	6	6	6

Evaluation Criteria :

- **Skor 1** : Not Yet Developing (The child is unable to perform the task or demonstrate the required skill)
- **Skor 2** : Starting to Develop (The child is able to perform the task only with teacher assistance or external stimulation)
- **Skor 3** : Developing as Expected (The child is able to perform the task independently, accurately, and consistently)
- **Skor 4** : Exceeding Expectations (The child is able to perform the task independently and precisely, while providing a logical explanation for their actions)



Figure 3. Children's Activities During the Unplugged Coding Pre-Test

Upon the completion of five intervention sessions, a post-test was conducted to evaluate the subjects' developmental progress. The scores obtained following the intervention are summarized in Table 2.



Table 2. Post-Test Results of Children's Computational Thinking Skills

Assessment Indicators	Child Name						
	Br	Rf	Zv	Gys	Yr	Rey	Fda
The child is able to identify game components: the starting point (start), the grid path on the board, and the selected traditional snack targets.	4	4	4	4	4	4	4
The child is able to categorize or utilize directional arrow cards based on color consistency (Red, Yellow, Blue, Orange, Purple, or Green) according to specific pattern instructions.	4	2	4	3	3	4	4
The child is able to determine the most effective route toward the target snack image, while disregarding irrelevant images or grid squares that are not designated as targets.	3	4	4	4	4	4	4
The child is able to arrange directional arrow cards sequentially to construct a logical series of movement instructions on the grid board.	3	4	3	2	3	2	4
TOTAL	14	14	14	13	14	14	16

Evaluation Criteria :

- **Skor 1** : Not Yet Developing (The child is unable to perform the task or demonstrate the required skill)
- **Skor 2** : Starting to Develop (The child is able to perform the task only with teacher assistance or external stimulation)
- **Skor 3** : Developing as Expected (The child is able to perform the task independently, accurately, and consistently)
- **Skor 4** : Exceeding Expectations (The child is able to perform the task independently and precisely, while providing a logical explanation for their actions)

The data presented in Table 2 indicate a significant increase in scores across all research subjects, with the majority of children reaching the criteria of "Developed as Expected" to " Exceeding Expectations". Visual documentation of the children's activities, demonstrating enhanced independence in formulating directional strategies during the post-test, is provided in Figure 4.



Figure 4. Children's Activities During the Unplugged Coding Post-Test



Data Analysis by Indicator

Table 3. Comparative Analysis of Mean Scores Based on Indicators

No	Computational Thinking Indicator	Mean Pre-Test	Mean Post-Test	Improvement
1.	Decomposition Identifying the starting point, the navigational path, and the specific traditional snack targets within the grid.	2	4	2
2.	Pattern Recognition Consistently utilizing arrow cards based on color symmetry and repeating sequences as instructed.	2	3,4	1,4
3.	Abstraction Determining the most efficient route toward the target snack while filtering out irrelevant objects or non-target grid squares.	1	3,7	2,7
4.	Algorithm Arranging directional arrow cards sequentially to construct a logical series of movement instructions.	1	3	2

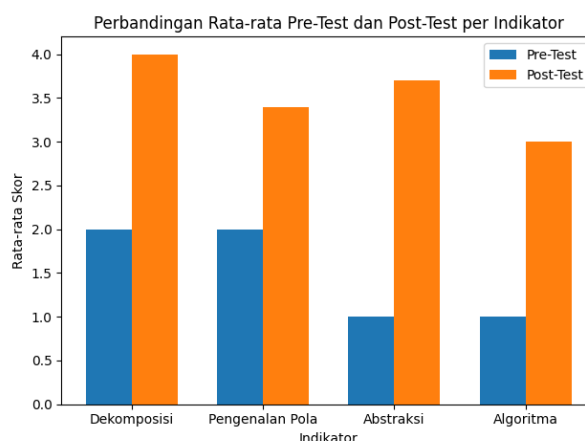


Figure 4. Bar Chart Comparison of Pre-Test and Post-Test Scores

Hypothesis Testing and Effectiveness Analysis

Paired Sample T-Test

Paired Samples Test									
Pair	Pre-test - Post-test	Paired Differences		Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
		Mean	Std. Deviation		Lower	Upper			
1	Pre-test - Post-test	-8.14286	.89974	.34007	-8.97497	-7.31074	-23.945	6	.000

Figure 5. Results of the Paired Sample T-Test

The results of the Paired Sample T-test, calculated using SPSS software, reveal a mean difference of -8.14286 between the pre-test and post-test scores. This negative value indicates that the children's computational thinking skills were significantly higher following the implementation of traditional snack-based unplugged coding compared to their initial baseline scores. Furthermore, the analysis yielded a significance value (Sig.(2-tailed)) of $p = 0.000$. In statistical conventions, a value of $p < 0$, denotes a significant difference in the subjects' computational thinking abilities before and after



the intervention. Consequently, it can be concluded that the use of traditional snack media is an effective pedagogical tool, resulting in a statistically significant improvement in the children's cognitive outcomes.

These findings are strongly supported by various literatures emphasizing the importance of introducing CT at an early age, as it is considered an essential 21st-century competence (Alifah & Widodo, 2024). In the context of early childhood education (ECE), CT activities must remain playful and engaging (Sehati & Pohan, 2025). Furthermore, the integration of STEM/STEAM approaches has proven effective in increasing children's interest in Science and Mathematics through an integrated framework. The implementation of unplugged coding offers high flexibility, particularly for schools with limited digital facilities (Mariana, 2025). The use of local media also aligns with the principles of ethnomathematics, which explore mathematical concepts embedded within culture (Ramadhani et al., 2024). Physical-based instructions (kinesthetic learning) have been shown to enhance children's memory retention regarding algorithmic steps (Rohmah et al., 2023). This is evident in subjects such as participants "Fda" and "Br," who demonstrated the ability to navigate complex routes during the post-test phase with high levels of confidence. The children's precision in arranging arrow sequences (algorithms) improved significantly because the traditional snack media provided them with a strong and familiar visual representation, making abstract concepts more concrete and relatable.

The enhancement of participants' computational thinking (CT) skills through traditional snack-based media corroborates Vygotsky's theory of social constructivism, which posits that learning is most effective when situated within a familiar cultural context (culturally responsive pedagogy). Utilizing visual media such as *klepon* and *onde-onde* facilitates abstraction one of the core pillars of CT by enabling children to transform physical objects into logical sequences. This aligns with Piaget's stages of cognitive development, which suggest that children aged 5–6 years are in the transition from the pre-operational to the concrete operational stage; thus, abstract algorithmic concepts must be bridged through the manipulation of tangible objects. Furthermore, these findings demonstrate that unplugged coding is not merely a technical activity but a profound cognitive process involving problem decomposition, wherein children learn to break down complex instructions into smaller, manageable components independently. Analysis of the Effectiveness of Traditional Snack-Based Unplugged Coding.

Analysis of the Effectiveness of Traditional Snack-Based Unplugged Coding

Based on the research findings, a highly significant improvement was observed in the Computational Thinking (CT) skills of children aged 5–6 years following the intervention using traditional snack media. The results of the Paired Sample T-test yielded a significance value of 0.000 ($p < 0,05$), indicating a statistically significant difference between the pre-test and post-test conditions.

Table 4. Critical Analysis of Computational Thinking Components via Traditional Snack Media

CT Component	Field Findings and Observations	Supporting Analysis and Citations
Decomposition	Children were able to break down a major task (reaching the target) into smaller, manageable steps (start, path, and finish).	Decomposition assists children in managing cognitive load by simplifying complex problems (Solehudin et al., 2024).
Pattern Recognition	Children recognized color regularities on the arrow cards and the visual characteristics of the snacks (e.g., <i>lapis</i> , <i>cenil</i>).	Pattern recognition in early childhood strengthens the foundations of mathematics and sequential logic (Arvy, 2023).
Abstraction	Children focused on the shortest route toward the snack image while disregarding distractors on the grid board.	Abstraction enables children to distinguish essential information from irrelevant details (Sabar et al., 2026).
Algorithm	Children arranged a sequence of arrow cards systematically to direct the "robot" (their movements).	The construction of logical steps is the core of screen-free (unplugged) programming (Mutoharoh et al., 2023).

Effectiveness analysis demonstrates that the utilization of "Unplugged Coding" media featuring traditional snacks yields impacts extending beyond technical logical mastery, specifically strengthening



the citizenship dimension of the Foundation Phase graduate profile. Within the framework of *Kurikulum Merdeka* (the Independent Curriculum), a deep learning approach is achieved when children do not merely memorize algorithmic steps but are capable of contextualizing such knowledge within their cultural identity.

Concrete media, such as *onde-onde*, *lumpia*, and *pisang ijo*, in unplugged coding activities serve as catalysts for children to recognize and appreciate local heritage from an early age (Yudiati et al., 2024). This effectiveness is evidenced by the pride and enthusiasm children exhibit when interacting with familiar everyday media, which inherently fosters a sense of belonging toward national heritage. Holistically, this ethnopedagogical integration proves that computational thinking stimulation can align with efforts to cultivate the identity of Indonesian children, those who possess a global outlook while remaining rooted in local values (Anggita et al., 2024). Consequently, local wisdom-based unplugged coding fulfills the essence of meaningful learning, producing not only digitally literate children but also citizens with robust sociocultural sensitivity.

Holistic Stimulation of Foundation Phase Learning Outcomes

The implementation of unplugged coding in this study targets not only cognitive abilities but also encompasses eight developmental domains within the Foundation Phase. The researchers observed that concrete traditional snack media act as a bridge between abstract algorithmic concepts and the child's real world. Regarding mathematical and scientific logic, where grid board activities exercise spatial orientation and cause-and-effect concepts, children understand that incorrect arrow instructions result in a failure to reach the objective. This aligns with findings by (Manches & Plowman, 2017) which suggest that manipulating physical objects reinforces the understanding of formal logic. Furthermore, literacy and language skills are stimulated when children assume the role of "programmers" and receive teacher instructions, leading to intense expressive language stimulation. In terms of motor and socio-emotional development, hand-eye coordination during the arrangement of arrow cards refines fine motor skills (Andry & Yaswinda, 2021), while group collaboration fosters self-regulation and empathy (Zahirah et al., 2025).

The Advantages of Local Media in Culturally Responsive Teaching

The use of traditional snacks as Educational Teaching Aids (*Alat Peraga Edukatif* or APE) introduces a new dimension to STEAM (Science, Technology, Engineering, Art, and Mathematics) education. The integration of local wisdom into the Early Childhood Education (PAUD) curriculum is proven to enhance student engagement. Snacks such as *klepon* and *onde-onde* are not merely objects; they serve as cultural narrative media that nurture a child's sense of self-identity. The utilization of these concrete media reduces screen-time dependency, a frequent concern in early childhood education (Yulianto & Musda, 2025). Unplugged coding offers a kinesthetic experience that is unattainable through digital applications.

CONCLUSION

Based on the data analysis, it can be concluded that the implementation of unplugged coding through traditional snack media is highly effective in developing the computational thinking skills of children aged 5–6 years. This effectiveness is evidenced by the results of the Paired Sample T-test, which yielded a significance value of 0.000 ($p < 0.05$), confirming a statistically significant improvement in the children's abilities following the intervention. Through the activity of arranging directional arrows toward traditional snack targets on a grid board, the children demonstrated substantial progress across the indicators of decomposition, pattern recognition, abstraction, and algorithms. Beyond honing cognitive aspects, the use of concrete media based on local wisdom holistically stimulates other foundational developmental milestones, such as fine motor skills and the reinforcement of self-identity through cultural exposure. This approach offers a technological learning solution that is economical, engaging, and screen-free, providing a safe and effective alternative to early childhood digital exposure. Theoretically, these results strengthen the integration of ethnopedagogy within modern educational curricula to build a foundation for digital literacy that remains rooted in local values.



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