

Improving Early Numeracy Skills Through Varied Button Media for Children Aged 4–5 Years at TK Kemala Bhayangkari 23 Pemalang

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Abstract

The abstract should be written in English in a single paragraph, with a maximum length of 250 words. It must provide a comprehensive yet concise overview of the entire study, which includes: (1) the research context or urgent problem being addressed, (2) the primary objective of the study, (3) the methodology used (such as research design, participants/sample size, instruments, and data analysis approach), (4) the core research findings with significant metrics if applicable, and (5) the main conclusion, sustainable innovation angle, or direct pedagogical implication. Do not include any citations, abbreviations without definitions, or references to internal tables/figures in this section. Early numeracy skills are an essential aspect of cognitive development in early childhood and need to be stimulated through learning activities that are appropriate to children's characteristics. Based on initial observations at TK Kemala Bhayangkari 23 Pemalang, the early numeracy skills of children aged 4–5 years were not yet optimal. This study aimed to improve early numeracy skills through the use of variation button media. The research employed Classroom Action Research (CAR) conducted in two cycles consisting of planning, implementation, observation, and reflection stages. The research subjects were 15 children. Data were collected through observation and documentation, and analyzed using descriptive percentage analysis. The results showed an increase in the percentage of children in the "Very Well Developed" category from 20% in the pre-cycle to 53.33% in Cycle I and 83.33% in Cycle II. Therefore, the use of variation button media was effective in improving children's early numeracy skills. This study contributes to the development of concrete media-based learning strategies in early childhood education.

Keywords: early numeracy, variation button media, early childhood education

1. INTRODUCTION

Understanding early childhood cognitive development requires a profound review of classical and contemporary theories that explain how humans begin to construct logical systems. Jean Piaget, a central figure in developmental psychology, posits that children aged 4–5 years are in the preoperational stage. At this phase, children begin to develop symbolic thinking skills; however, their reasoning remains tied to direct visual perception and is often egocentric in nature (McLeod 2025). Children at this stage do not yet fully grasp the principle of conservation, where they may perceive that the quantity of objects changes if their arrangement is altered, even when nothing has been added or removed.

Early numeracy skills are a vital component of early childhood cognitive development, as they serve as the foundation for logical thinking and problem-solving at higher levels of education (Fitriya et al. 2025). This capability is not merely the skill of memorizing symbols, but rather a complex mental process involving an understanding of quantity, patterns, and the relationships between objects in the real world. Early numeracy encompasses the ability to recognize numbers, count objects, compare quantities, and understand the concepts of "more" and "less" (Perdana dan Suswandari 2021).

However, in kindergarten teaching practices, numeracy stimulation is often still conducted through worksheets and conventional methods that lack involvement in a child's concrete experiences (Rahmadian 2024). The excessive use of worksheets at an early age tends to force abstraction processes before the child has a strong sensory foundation, which often leads to boredom or even "math anxiety" in the future (Sufa 2022). The importance of concrete experience in the preoperational stage cannot be overlooked. Children build cognitive schemas through the assimilation and accommodation of new information received through the senses. When children interact with concrete media such as buttons, they do not just see the digit "3"; they hold three tangible physical units (Mellinia, Mulyanti, dan Priendarningtyas 2025).

Various studies over the past decade indicate that the use of concrete media and play-based learning effectively enhances early childhood numeracy skills (Anggraeni, Ma'rufi, dan Suaedi 2021). Concrete media serve as a bridge between a child's intuitive mind and formal mathematical concepts. Studies on concrete manipulatives in early mathematics education emphasize that children understand number concepts more easily through exploratory activities and hands-on learning (Afandi dan Ernawati 2024). Through physical manipulation, children can sense the weight, texture, and spatial existence of an object (Mellinia et al. 2025), which the brain then translates into numerical representations. Other research also shows that the use of real-world objects can improve the understanding of quantity concepts and grouping in children aged 4–5 years (Fadilah et al. 2023).

Nonetheless, most previous research has focused on the use of number blocks, number cards, or board games, while the utilization of simple media such as varied buttons is still rarely studied specifically within the context of Classroom Action Research (CAR). Based on this review, there is a research gap regarding the optimization of varied buttons as manipulative tools to improve early numeracy in 4–5-year-olds (Daniyati et al. 2023). Varied buttons are unique because they are colorful, come in diverse shapes, are easily obtainable, and allow children to engage directly in counting, grouping, and comparing (Monalisa dan Maimunah 2024). Therefore, this study presents an element of novelty in the utilization of simple, concrete-based media within a classroom action framework to enhance children's early numeracy (Putri 2025). This effort aligns with the demands of the Kurikulum Merdeka (Independent Curriculum), which emphasizes meaningful, contextual, and child-centered learning (Hidayat dan Nurlatifah 2023). This research is crucial given the low early numeracy skills of children at TK Kemala Bhayangkari 23 Pemalang, as indicated by initial observations. Based on these issues, the objective of this study is to improve the early numeracy skills of children aged 4–5 years through the use of varied button media

2. METHODS.

This study employs a Classroom Action Research (CAR) approach using a spiral model consisting of four stages: planning, acting, observing, and reflecting (Suharsimi Arikunto 2021). This model refers to the CAR concept developed by Kemmis and McTaggart, in which each cycle is conducted iteratively to improve the learning process until the desired results are achieved (Mohd dan Syafiq 2015).

The research was conducted in two cycles. Each cycle comprises the planning stage (preparation of Daily Lesson Plans/RPPH, observation instruments, and learning media), the acting stage (implementation of

learning activities according to the plan), the observing stage (observation of early numeracy skills and teacher performance), and the reflecting stage (evaluation of results to inform improvements for the subsequent cycle) (Utomo, Asvio, dan Prayogi 2024).

The subjects of this research are 15 children aged 4–5 years at TK Kemala Bhayangkari 23 Pemalang for the 2025/2026 academic year.

Data collection techniques include: Observation: Utilizing observation sheets for early numeracy skills and teacher performance. Documentation: Consisting of photographs of learning activities and children's work (Anggraeni dan Palopo 2021). Data were analyzed using descriptive quantitative analysis by calculating the percentage increase in early numeracy skills in each cycle using the following formula (Sutopo, Umrotullatifah, dan others 2025):

$$\text{Percentage} = \frac{\text{Number of children in the "Developed Very Well" category} \times 100\%}{\text{Total number of children}}$$

The indicator of research success is established when at least 75% of the children reach the "Developed Very Well" (BSB) category (Faradila, Saleh, dan Adnan 2025). If this indicator is met, the intervention is declared successful

3. RESULTS AND DISCUSSION

A. Research Results

This classroom action research was conducted in two cycles involving 15 children aged 4–5 years at TK Kemala Bhayangkari 23 Pemalang. The study aims to improve Early Numeracy and Early Childhood Cognitive Development through interventions provided within the learning process

1. Pre-Cycle

Based on initial observations before the intervention, the children's cognitive and numeracy levels were still categorized as low. Out of 15 children, the majority were in the Starting to Develop (MB) category, and only a small fraction reached the Developed Very Well (BSB) category. Classically, the percentage of children achieving the BSB category had not yet met the established success indicator of 75% (Saputra 2021).

Children were able to recite numbers 1–10 verbally but did not understand the concept of the quantity represented. Learning was still confined to thematic books and completing worksheets, causing children to become bored quickly due to the lack of manipulative media that could be explored physically.

2. Cycle I

In Cycle I, learning was implemented according to the prepared plan, specifically introducing buttons as play media. The focus was on color classification and counting 1–5. The results showed an initial improvement but failed to meet the target as children were still in the adaptation phase with the new media. Activities included: Introducing children to various button colors (red, blue, yellow), asking children to sort buttons and place them into containers of matching colors, counting small quantities of buttons to build hand-eye coordination.

Observation results showed that learning mastery began to rise to the 30% - 55% range. However, reflection revealed that some children still struggled to distinguish between button sizes that were nearly identical and frequently skipped objects while counting.

Because the percentage of children reaching the BSB category remained below 75%, the research proceeded to Cycle II.

3. Cycle II

Based on the reflections from Cycle I, improvements were made in Cycle II by providing clearer instructions, more intensive motivation, and more effective classroom management. The planned activities involved modified interventions with more complex challenges, such as using number cards and buttons of varying sizes (large, medium, small). During implementation:

- a. Children were asked to pick a number card (e.g., number 7) and then collect exactly 7 buttons to place on the card.
- b. Children were encouraged to sequence buttons from smallest to largest through a "set aside one by one" activity.
- c. Children grouped buttons based on color AND the number of holes (e.g., red buttons with four holes).

Results in Cycle II showed a significant increase in learning mastery, with the percentage of children reaching the Developed Very Well (BSB) category rising to 83.33%. Children began to show initiative in choosing their own counting strategies. Since this percentage exceeded the 75% success indicator, the intervention was declared successful, and the research concluded at Cycle II.

B. Discussion

The research findings indicate that the provided interventions achieved optimal success levels gradually from the pre-cycle to Cycle II. This improvement occurred because children were given opportunities to learn through direct experience, exploration, and the free expression of ideas.

Learning that involves hands-on activities and engaging media makes children more motivated and less prone to boredom (Astutik 2022). Children aged 4–5 are at a developmental stage that requires concrete experiences in learning (Ponidi, Kristina, dan Gumanti 2020). This aligns with Jean Piaget's theory of cognitive development, which states that early childhood learners learn through direct activity and real-world experiences (Alfadhilah 2025). Button media proved effective because it provides instant visual and tactile feedback, which is highly suitable for Piaget's preoperational stage (McLeod 2025).

Manipulative media are defined as physical tools that children can touch and move to visualize abstract concepts. Varied buttons offer advantages that digital media or paper worksheets do not. Buttons are "loose parts"—materials that can be moved, redesigned, and combined freely (Jalil et al. 2025).

Furthermore, the children's progress was influenced by the teacher's role as a facilitator providing guidance and positive reinforcement (Anwar et al. 2023). This is consistent with Lev Vygotsky's view, which emphasizes the importance of social support in aiding child development through interaction and guidance (Setiawan 2024).

By improving the learning process in each cycle, children's numeracy skills developed optimally. The use of varied button media through a structured CAR cycle proves that educational innovation does not have to be expensive. By utilizing concrete objects, teachers can help children move past "rote counting" toward a deep understanding of number concepts (Hurmawati et al. 2025). The key lies in the teacher's creativity in sequencing actions from simple (single-

color classification) to complex (size seriation and one-to-one correspondence) to build a solid numeracy foundation for the child's academic future.

Overall, the results of this study prove that the interventions applied in learning are effective in improving the numeracy skills of children aged 4-5 at TK Kemala Bhayangkari 23 Pemalang.

4. CONCLUSION

Based on the results of the classroom action research conducted in two cycles involving children aged 4–5 years at TK Kemala Bhayangkari 23 Pemalang during the 2025/2026 academic year, it can be concluded that the instructional interventions applied in this study successfully increased children's numeracy skills gradually and significantly.

Observations during the pre-cycle stage indicated that the children's level of numeracy skills was initially low. Most children were not yet able to demonstrate diverse ideas, lacked confidence in expressing their thoughts, and required intensive guidance from the teacher. The percentage of children achieving the Developed Very Well (BSB) category had not yet met the established success indicator of at least 75% classically.

Following the intervention in Cycle I, there was an improvement in the children's numeracy skills compared to the initial condition. Children began to show courage in proposing ideas, became more active in participating in learning activities, and were able to produce more varied work. Nevertheless, the results in Cycle I did not fully reach the success indicator, necessitating improvements in the subsequent cycle.

Based on the reflections from the first cycle, Cycle II implemented refinements in learning strategies, more intensive motivation, and more effective classroom management. The results in Cycle II showed a significant increase, with the percentage of children reaching the Developed Very Well (BSB) category rising to 83.33%. This percentage exceeded the 75% success threshold; therefore, the intervention was declared successful.

In conclusion, it can be affirmed that the implementation of learning designed in a planned, systematic, and reflective manner through the Classroom Action Research model is effective in enhancing the numeracy skills of children aged 4–5 years at TK Kemala Bhayangkari 23 Pemalang. The findings of this study demonstrate that by providing children with opportunities to explore, create, and express ideas freely through concrete media, we can not only foster their creativity but also optimize their foundational understanding of numeracy.

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