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# COGNITIVE LEARNING STRATEGY THROUGH NUMBER GAMES USING BOTTLE CAPS FOR CHILDREN AGED 4–5 YEARS AT TK ALAM PURWAKARTA IN THE 2025/2026 ACADEMIC YEAR

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**Abstract:**

This study was motivated by the importance of stimulating cognitive aspects in early childhood as one of the foundations for intellectual development and logical thinking skills. Observations at Alam Purwakarta Kindergarten showed that some 4-5-year-old children still had difficulty recognizing numbers, counting objects, and grouping objects according to the correct numbers. This is thought to be due to conventional teaching methods that do not actively involve children. Therefore, this study examines the effectiveness of cognitive learning strategies through number games based on bottle caps, which are designed to suit the characteristics of early childhood, namely learning through play.

Based on these results, it can be concluded that cognitive learning strategies through bottle cap number games are very effective in improving the cognitive abilities of early childhood. This medium is not only simple and environmentally friendly, but also capable of creating a fun, interactive, and contextual learning atmosphere in line with the world of children. The application of this strategy not only helps children understand number concepts concretely but also fosters self-confidence, active engagement, and logical thinking skills, which are important foundations for the next stage of education.

**Keywords:** *cognitive ability, learning strategy, number game, bottle cap media*

**Abstrak:**

Penelitian ini dilatarbelakangi oleh pentingnya stimulasi aspek kognitif pada anak usia dini sebagai salah satu fondasi dalam perkembangan intelektual dan keterampilan berpikir logis. Hasil observasi di TK Alam Purwakarta menunjukkan bahwa sebagian anak usia 4–5 tahun masih mengalami kesulitan dalam mengenal angka, menghitung jumlah benda, serta mengelompokkan objek sesuai dengan bilangan yang tepat. Hal ini diduga disebabkan oleh metode pembelajaran yang masih bersifat konvensional dan kurang melibatkan anak secara aktif. Untuk itu, penelitian ini mengkaji efektivitas penerapan strategi pembelajaran kognitif melalui permainan bilangan angka berbasis tutup botol yang dirancang agar sesuai dengan karakteristik anak usia dini, yaitu belajar sambil bermain.

Berdasarkan hasil tersebut, dapat disimpulkan bahwa strategi pembelajaran kognitif melalui permainan bilangan angka berbasis tutup botol sangat efektif untuk meningkatkan kemampuan kognitif anak usia dini. Media ini selain sederhana dan ramah lingkungan, juga mampu menciptakan suasana belajar yang menyenangkan, interaktif, dan kontekstual sesuai dengan dunia anak. Penerapan strategi ini tidak hanya membantu anak dalam memahami konsep bilangan secara konkret, tetapi juga menumbuhkan rasa percaya diri, keterlibatan aktif, serta kemampuan berpikir logis yang merupakan bekal penting untuk tahap pendidikan berikutnya.

**Kata Kunci:** *kemampuan kognitif, strategi pembelajaran, permainan bilangan, media tutup botol*

## INTRODUCTION

Preschool education is in accordance with the provisions of the Indonesian government in Law 27 of 1990, Chapter 1, Article 1, which states that preschool education is education to assist the physical and spiritual growth and development of students outside the family environment before entering primary education, which is organized in schools or outside of schools. Kindergarten is a form of preschool education that provides early education programs for children aged four years old until they enter primary education. The age of 0-6 years is a crucial period for children's growth and development. At this age, children are in a sensitive period for receiving targeted stimuli and are encouraged to reach their optimal level of growth and development. With this, basic behaviors and abilities can develop properly and correctly. Therefore, early education for young children is quite important in determining their future (Fardiah et al., 2019).

One form of preschool education is early childhood education (PAUD), which is one of the smallest forms of organization where children can play and carry out activities under the guidance of teachers or educators by developing mental functions in accordance with the principles of child development. Early childhood education is a form of education that focuses on laying the foundation for physical growth and development, such as cognitive and gross motor coordination. Cognitive aspects include thinking skills, creativity, emotional intelligence, and spiritual intelligence.

Cognitive is one of the six aspects of early childhood development. Development is a change that every individual or group of people will experience in reaching maturity. This change is usually systematic, progressive, and continuous, both physically and psychologically. Santrock explains that development is continuous, meaning that previous developments are closely related to subsequent developments. Cognitive comes from the word cognition, which is synonymous with the word knowing. In other words, the word cognition means acquisition, organization, and knowledge.

Cognitive refers to a person's ability or intelligence in learning new skills and concepts, understanding what is happening in the environment, and the ability to remember and solve simple problems (Wiyani, 2014). Cognitive can also be defined as a person's ability to understand something and have a clear picture of it. Cognitive ability is the ability to think complexly and use reason to solve problems (Khadijah, 2016). Cognitive is also referred to as broad knowledge, reasoning ability, creativity or inventiveness, language ability, and memory ability. This ability can make it easier for children to master broader knowledge so that they can use it in their daily lives.

Cognitive abilities are abilities in the thinking process, such as the ability to connect one thing with another, assess, or consider. Cognitive development grows and continues to develop along with physical development and other nerves located in the central nervous system (Rozana, 2020). Cognitive development is inseparable from the thinking process that occurs in the human brain. Cognitive aspects are closely related to other aspects of development. Therefore, cognitive development can be divided into three main concepts, namely: 1) the concept of general knowledge and science; 2) the concept of numbers, symbols, and letters; 3) the concept of colors, sizes, shapes, and patterns (Khadijah, 2016).

Observations conducted at Alam Purwakarta Kindergarten show that some children are not yet optimal in understanding basic number concepts such as

recognizing numbers, counting objects on flashcards, and grouping objects on flashcards. This may be due to a conventional learning approach that does not actively involve children in the learning process.

As stated by Mulyasa (2017), "the learning strategy emphasizes children's learning and playing activities as well as teachers' activities in guiding and assisting children." Therefore, a contextual and enjoyable learning strategy is needed so that children can learn actively and meaningfully.

The alternative used by the researcher is a number game based on bottle caps. The media used is easy to obtain, environmentally friendly, and can be modified according to learning needs. Through this game, children can learn to recognize numbers, count, and group concretely and visually. This strategy also supports the principle of learning while playing, which is in line with the characteristics of early childhood.

According to Setiasih (2014), teachers play an important role as facilitators in creating a conducive and enjoyable learning atmosphere so that children can develop their cognitive potential optimally. By applying bottle cap-based counting games, teachers can create interactive, creative learning that is appropriate for children's development.

The researcher aims to examine the effectiveness of cognitive learning strategies through bottle cap-based number games in improving logical thinking skills and number concept understanding in 4-5-year-olds at Alam Purwakarta Kindergarten.

## RESEARCH METHOD

The type of research applied is classroom action research (CAR). CAR is a type of research conducted by someone in their own classroom to improve learning outcomes and quality. CAR raises issues that exist in the classroom by teachers who observe learning activities in the form of actions to improve and enhance learning practices in the classroom in a professional and conditional manner.

The subject of this research is 17 students (aged 4-5 years) at Alam Purwakarta Kindergarten, consisting of 8 boys and 9 girls. The object of this research is to improve children's cognitive abilities through bottle cap games. This research is a classroom action in which the researcher hopes to see an improvement in the cognitive abilities of 4-5-year-old children through bottle cap games at TK Alam Purwakarta.

## FINDINGS AND DISCUSSION

In this study, cognitive abilities in early childhood were improved through bottle cap number activities with sample group A1. Before conducting the study, the researchers first conducted observations to obtain information about the learning process that was taking place. In the data collection process, the first technique used was observation, which is the recommended method for obtaining all information about learning. Observation should focus on ongoing learning activities by observing every change that occurs in each student.

At the beginning of the study, there were still some problems that arose during the pre-cycle process regarding the learning outcomes and responses of the students to the bottle cap number activity. With the problems that occurred at the beginning, the researchers reflected on these problems so that they could be corrected in cycle I with the hope that the students would be able to improve their

cognitive abilities through the bottle cap number activity. The calculations showed that 6 students still had an average score (32%). It can be said that the level of success in improving cognitive abilities through bottle cap activities is still in the beginning to develop (MB) category.

The next step is to analyze and manage the data obtained. The research data analyzed consists of children's cognitive ability improvement scores from cycle I and cycle II. After conducting the research, the results obtained from the calculation and management of the data produced values that answer the questions in this study, namely regarding the improvement of children's cognitive abilities through bottle cap number activities at Alam Purwakarta Kindergarten.

In cycle I, there were still several problems with student learning outcomes and responses to bottle cap number activities during the bottle cap number practice process. With the problems that occurred in cycle I, the researcher reflected on these problems so that they could be corrected in cycle II with the hope that all students would be able to improve their cognitive abilities through bottle cap number activities. The researcher's calculations showed that (8 students) still had an average score of (78%), meaning that (8 students) were in the developing category as expected (BSH) and (6 students) were still in the beginning to develop category (MB). The following are the results of cycle I to improve cognitive abilities through bottle cap number activities.

**Data Processing Cycle 1**

**Planning**

Data collection was carried out using bottle cap number games during two meetings, with each meeting lasting approximately 15-20 minutes. The activities were carried out in accordance with the daily learning plan that had been prepared in advance. The bottle cap number games were played with the children both inside and outside the classroom.

**Implementation**

The first meeting introduces bottle cap numbers, then the children are given instructions to follow what the teacher is doing in front of them. After that, the children are directed to line up at the back to wait for their turn to play with their friends. After that, the teacher asks the children to play according to the instructions given by the teacher earlier.

At each meeting, the researcher will discuss numbers before the game begins with supporting media. After the number introduction activity is carried out, in order for the children to remember the numbers 1-5, the teacher will ask the children to say the names of the numbers before starting the lesson.

**Observation**

In cycle I, there were still several problems with student learning outcomes and responses to the bottle cap number game during the practical play session. Based on the problems that arose in cycle I, the researcher reflected on these issues so that they could be corrected in cycle II, with the hope that all students would be able to improve their cognitive abilities through the bottle cap number game. The results of the calculations produced with a total of 15 students still showed an average (67%), namely (14 students) in the developing category as expected (BSH) and (1 student) still in the beginning to develop category (MB). The following are the results of cycle I to improve cognitive abilities through bottle cap number games.

**Table : 1 Student Learning Outcomes in Cycle 1**

| Student name | Siclus 1 | Information |
|---|---|---|
| HR | 62 | BSH |
| HBS | 49,5 | MB |
| KBR | 59,1 | BSH |
| SH | 51,1 | BSH |
| DZF | 60,5 | BSH |
| QQ | 68,6 | BSH |
| AZL | 73 | BSH |
| KY | 54 | BSH |
| LBB | 53,3 | BSH |
| NSW | 71,3 | BSH |
| SLM | 72,8 | BSH |
| SJN | 68 | BSH |
| UMR | 61,5 | BSH |
| ZE | 63,5 | BSH |
| ZY | 63,1 | BSH |
| **Amount** | **931,1** | |
| **Average** | **62%** | |

## Reflection

The main objective of this study is to determine the improvement in cognitive abilities through playing with number bottle caps. Therefore, the reflection presented will focus on improving cognitive abilities through playing with number bottle caps. In cycle I, there were deficiencies in students, such as the selection of number bottle caps and the placement or matching of numbers that were not accurate. The researcher found that students were unable to distinguish between the numbers 2 and 5. There are several factors that caused this to happen. First, the students did not pay attention when the teacher introduced numbers 1-5 before the game started. Second, when the children matched the number bottle caps on the upside-down number box, the numbers were reversed, so that the number 2 looked like the number 5 and the number 5 looked like the number 2.

Based on these findings, the researchers developed new strategies to reduce the causes of deficiencies in the bottle cap number game activity, which will likely be implemented in cycle II. For the first problem, the researchers will better condition the children's focus when introducing numbers in front of them. For the second problem, the researchers will explain using PTK media directly and provide an explanation of the difference between the numbers 2 and 5.

## Data Processing Cycle 2

## Planning

Based on the results of the reflection from the implementation of cycle I, the researcher found several obstacles that affected the optimization of children's cognitive ability improvement. These obstacles included children's inability to distinguish between numbers, namely 2 and 5. In addition, some children had difficulty finding bottle caps with numbers that matched the flashcards.

Therefore, the researcher developed a plan for cycle II with several improvements to the strategy so that the research objectives could be achieved optimally. The steps for improvement that were designed included:

1. Providing ice breaking numbers

When introducing numbers 1-5, the researcher explained them using ice breaking to attract children's attention to recognize numbers.

2. Using visual aids

The researcher introduced numbers using PTK media consisting of number bottle caps and number boxes so that children could distinguish between numbers 1-5.

**Implementation**

The implementation of cycle II was carried out during one meeting, lasting 20 minutes. The meeting was conducted according to the lesson plan (RPP). The teacher reintroduced numbers to the children using visual aids accompanied by ice breaking activities to attract the children's attention so that when introducing numbers, the children could pay attention and listen carefully.

The researcher will randomly select numbers from the box and ask the children to say the numbers that the researcher has selected from the box, providing positive feedback so that the children will be more confident when saying their answers. The researcher will evaluate the children's mastery and give appreciation to children who show improvement. All activities will be carried out in the classroom so that the children can be properly conditioned.

**Observation**

Cycle I to improve cognitive abilities through bottle cap number games and flashcards about my family. Based on the results of observations conducted during the implementation of cycle II, there was a significant improvement in the children's cognitive abilities. The children showed clear improvement in distinguishing between different types of numbers, as well as their ability to focus on the teacher who was teaching in front of them. The children appeared confident, active, and fully engaged in the activities.

**Table : 2 Student Learning Outcomes in Cycle 2**

| Student name | Siclus 2 | Information |
|---|---|---|
| HR | 75,5 | BSH |
| HBS | 73 | BSH |
| KBR | 76,1 | BSH |
| SH | 76,1 | BSH |
| DZF | 78,3 | BSH |
| QQ | 81,5 | BSB |
| AZL | 84,5 | BSB |
| KY | 77,1 | BSH |
| LBB | 72,3 | BSH |
| NSW | 81,8 | BSB |
| SLM | 83,3 | BSB |
| SJN | 82,5 | BSB |
| UMR | 79,6 | BSH |
| ZE | 79,6 | BSH |
| ZY | 81,3 | BSB |
| **Amount** | **1.182** | |
| **Average** | **79%** | |

The data shows that:

- 82% of students achieved the Very Good Development (BSB) category.
- 67% of students were in the Expected Development (BSH) category.
- No students were in the Beginning Development (MB) category, unlike in Cycle I.

The increase in the average score from the previous cycle also demonstrates the success of the improved strategy that was implemented.

**Reflection**

The results of cycle II show that the systematic and planned application of the bottle cap number game method can significantly improve the cognitive abilities of early childhood. The problems found in cycle I were successfully overcome through methods, strategies, and the use of ice breakers that were able to attract children's focus during the introduction of numbers.

Students were not only able to better distinguish numbers 1-5, but also understand the number of objects depicted on flashcards. The learning atmosphere became more enjoyable, interactive, and conducive, which had a positive impact on student learning.

Based on the achievement of the success indicator, namely 82% of students were in the Very Good Development category, the researcher was deemed successful and stopped at cycle II.

**Pict 1. Playing bottle cap numbers cycle 1**

**Pict 2. Playing bottle cap numbers cycle 2**

## CONCLUSION

Based on the results of classroom action research conducted at Alam Purwakarta Kindergarten in the 2025/2026 academic year by applying cognitive learning strategies through number games based on bottle caps for children aged 4–5 years, several conclusions can be drawn as follows:

First, the children's cognitive abilities at the beginning of the study were still relatively low. This was evident from the children's difficulty in recognizing numbers, distinguishing number symbols, and connecting numbers with concrete objects. The pre-cycle observation results showed that many children were still in the Beginning to Develop (MB) category, indicating a need for more interactive and enjoyable learning innovations.

Second, the application of cognitive learning strategies through bottle cap number games in cycle I began to show improvement, although the results were not yet optimal. Some children were able to recognize numbers and match them with objects, but there were still obstacles such as lack of focus during activities and errors in distinguishing certain numbers.

Third, after improvements were made in cycle II by adding ice breaking, the use of visual media, and providing positive feedback, the children's cognitive abilities improved significantly. The children's average learning scores increased to 79%, with the majority of children reaching the Very Good Development (VGD) category. No children remained in the Beginning Development (BD) category, which means that the research success indicators had been achieved.

Thus, it can be concluded that the cognitive learning strategy through number games based on bottle caps is effective in improving the cognitive abilities of early childhood, especially in recognizing and understanding number concepts. In addition to being simple and environmentally friendly, this media can also create fun, interactive learning that is suitable for the characteristics of early childhood. This strategy is very relevant for teachers to apply in order to develop children's logical thinking skills as an important foundation for the next level of education.

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