Academic Journal Research
Homepage : https://journal.antispublisher.com/index.php/acjoure
Email : admin@antispublisher.com

e-ISSN : 3026-3085
ACJOURE, Vol. 2, No. 2, December 2024
Page 39-46

Extracurricular Abacus to Improve the Cognitive Arithmetic Skills of Children Aged 5-6 Years

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DOI : https://doi.org/10.61796/acjoure.v2i2.234

Sections Info

Article history:
Submitted: November 01, 2024
Final Revised: November 15, 2024
Accepted: November 30, 2024
Published: November 30, 2024

Keywords:
Extracurricular abacus
Cognitive abilities
Early childhood

ABSTRACT

Objective: *This study evaluates the impact of the abacus extracurricular program on the cognitive development of children aged 5–6 years, focusing on arithmetic skills such as logical thinking, problem-solving, and critical thinking.* ***Methods:*** *A qualitative descriptive method was employed, involving observations, interviews with educators, and documentation analysis at RA Depag 1 Mojokerto. Data were collected from 16 students actively participating in abacus extracurricular activities. Data analysis followed the Miles and Huberman model, encompassing reduction, presentation, and verification to draw conclusions.* ***Results:*** *Findings indicate that abacus activities foster improved arithmetic ability through visual and interactive learning. Children demonstrated increased concentration, memory retention, and fine motor skills via bead manipulation. The weekly group-based learning sessions encouraged collaborative problem-solving and formula memorization within time constraints, effectively stimulating cognitive and motor skill development. Moreover, the integration of abacus learning into extracurricular activities was met with enthusiasm and improved educational outcomes.* ***Novelty:*** *This study highlights the significance of the abacus as a traditional yet effective tool for early cognitive development, emphasizing its dual role in enhancing logical reasoning and fine motor skills. The tailored approach for early learners, focusing on visual and tactile methods, distinguishes this program from conventional math teaching practices.*

INTRODUCTION

Cognitive or reasoning ability is an aspect of development that can be honed in early childhood. Cognitive is the child's thinking process, which is the individual's ability to connect, evaluate, and consider an event, the process of which is related to the level of intelligence, marking a person with various interests, especially directed towards ideas and learning. Cognitive development is related to brain development [1], [2]. Brain development refers to the development concerning the size (volume) and function of the brain [3].

Counting ability is one of the important cognitive aspects in child development, especially at an early age [4]. Counting not only involves the ability to memorize numbers or perform simple mathematical operations, but also includes the development of logical thinking, problem-solving, and critical thinking skills. Therefore, it is important to provide appropriate stimulation to children from an early age so that their cognitive abilities, especially in counting, can develop optimally [5].

In the teaching and learning activities, the lack of clarity in the material presented can be assisted by using media as an intermediary. The functions and purposes of

applying learning media in developing children's cognitive abilities are to motivate children to engage in learning activities, to serve as teaching aids to clarify the material, to develop children's creativity, to help achieve optimal learning outcomes, and to serve as a medium for play for early childhood [6].

One of the methods widely used to improve children's counting skills is through the use of an abacus [7]. The abacus, also known as the abacus, is a traditional tool used for performing arithmetic calculations. According to the theory of mental arithmetic, this abacus can enable children to master and optimally utilize their entire potential and absorb advanced knowledge later on [8]. The use of the abacus in education has proven effective not only in enhancing arithmetic skills but also in stimulating the overall cognitive development of children [9].

The initial concept of using an abacus is to introduce its parts, each of which has a different function. On the abacus, the beads function as value operators for counting, with the lower beads valued at one and the upper beads valued at five. By using an abacus, the child's cognitive ability in counting and fine motor skills using their fingers will be indirectly trained in a balanced manner. Children in group B aged 5-6 years are basically already capable of performing basic addition and subtraction operations [10].

The extracurricular abacus program is now increasingly popular in various educational institutions, especially at the early childhood school level. This program offers a different approach compared to conventional classroom math teaching methods. With regular practice using the abacus, children can develop speed and accuracy in arithmetic, as well as improve their concentration and memory skills. However, there are still some parents who might feel that the abacus media does not align with the way they learned mathematics, especially if they prioritize the conventional methods that are more commonly used in schools.

Abacus extracurricular in Early Childhood Education (ECE) is a traditional counting tool used to teach basic number and math concepts. In ECE, abacus is used as an enjoyable method to introduce young children to the concept of counting. The use of the abacus is considered capable of helping children understand mathematics more concretely, because children can "see" and "touch" numbers through the beads that are moved around. One of the reasons why the abacus extracurricular is becoming increasingly popular in Early Childhood Education (ECE) is the claim that the abacus can enhance children's cognitive abilities, particularly in logical thinking, concentration, and memory. Using an abacus also involves both hands, which is believed to stimulate the simultaneous activity of the left and right brain, helping to enhance the overall intelligence of children.

The abacus extracurricular activity at RA Depag 1 Mojokerto is quite interesting, as it is played by children aged 5-6 years. The children at RA Depag 1 Mojokerto are very enthusiastic about participating in the extracurricular activities; they are very eager to memorize the formulas given by the private abacus tutor. The abacus lessons at RA Depag 1 Mojokerto are usually held once a week, and the learning method is through

group study. So there is a predetermined time, for example, one question is given 3 minutes to calculate and then answer, and immediately the teacher points out to compare with classmates.

The abacus formula for Early Childhood Education (ECE) children is usually made simple to match their abilities. The abacus is a counting aid that helps children understand basic mathematical concepts, such as addition and subtraction, in a visual and interactive way [11]. Usually, the abacus for early childhood education consists of several rows of beads that can be moved left or right. Each row represents a unit of numbers, and children are taught to move the beads to count [12], [13]. This helps them develop fine motor skills while also learning number concepts in a more concrete way.

The abacus can develop a child's fine motor skills by moving beads, which helps train hand coordination and finger skills. Children gain an understanding of addition and subtraction visually, improving their ability to focus while performing calculations [14], [15].

Therefore, this study aims to evaluate the impact of the abacus extracurricular program on the improvement of children's cognitive abilities in arithmetic. This research is expected to provide deeper insights into the effectiveness of the abacus as a learning tool and contribute to the development of more effective educational methods in enhancing children's cognitive abilities.

RESEARCH METHOD

This research uses a qualitative method with a descriptive approach, where the data consists of words and direct observations from the field. Qualitative research excels in describing and analyzing events that occur in the field. Moleong states that qualitative descriptive research analyzes data in the form of words, not numbers, obtained from interviews, field notes, and other documents. The research was conducted at RA Depag 1 Mojokerto with 16 students participating in the extracurricular abacus activities. Primary data were obtained directly from the field, while secondary data consisted of literature and supporting documents related to the social skills of children aged 5-6 years in the activity.

The data collection techniques in this study include observation conducted by recording the results of observations according to the observation instrument, where children are able to understand the basic concept of addition through the abacus. Interview data were collected from the supervising teacher and the principal through questions listed in the instrument sheet, which includes special techniques used when teaching the abacus, as well as routine evaluations of the development of children participating in the abacus extracurricular activities. Documentation was obtained by digging into data in the form of photos of children's activities during the drum band extracurricular, abacus guidebooks, school vision and mission, extracurricular programs, and lesson plans. Data analysis follows the Miles and Huberman model, which consists

of data reduction, presentation, and verification. The conclusion is drawn from observation notes, interviews, and documentation [16].

RESULTS AND DISCUSSION

Counting ability is an important aspect of early childhood cognitive development, encompassing logical thinking, problem-solving, and critical thinking. To support this development, proper stimulation is very necessary from an early age. At RA Depag 1 Mojokerto, the abacus extracurricular activity attracts attention because it involves children aged 5-6 years. The children enthusiastically participated in this activity, learning to memorize formulas and solve problems within a certain time. This activity, held weekly in groups, not only aids in the visual understanding of addition and subtraction but also trains fine motor skills through bead movements, enhancing focus and hand coordination.

Based on the presentation and verification of data regarding the abacus extracurricular activity in enhancing the cognitive counting abilities of children aged 5-6 years, the results encompass three stages: Planning, Implementation, and Evaluation. The results of the field research show the following description.

Abacus is an abbreviation for the System of Education to Optimize Children's Brain Potential. This means that through Abacus learning, students' thinking abilities can be continuously improved [17]. Abacus was chosen as an extracurricular activity for preschool children because it is effective in helping children understand counting concepts concretely, training concentration, memory, and hand-eye coordination, as well as making learning mathematics more enjoyable and engaging.

There is a special approach to teaching the abacus to preschool children. Early childhood education emphasizes fun and visual-based methods, such as games or activities that directly involve the use of the abacus. This approach differs from that used for older children, who focus more on practice and theoretical understanding of concepts. For preschool children, the teaching technique is more practical and interactive, aiming to build a basic understanding of numbers and counting through direct experience.

This abacus program has been running for quite a while. The challenges in its implementation include adjusting methods to the age of Early Childhood Education (ECE) children, maintaining the focus of children who are easily distracted, and ensuring that learning remains engaging and enjoyable so that children stay motivated. The evaluation of this program is conducted through regular monitoring of children's counting abilities, using tests or exercises appropriate for their age. The teacher also observes improvements in the child's concentration, memory, and confidence in counting, and regularly provides progress reports to the parents.

There is a difference in cognitive abilities in counting between children who participate in the abacus program and those who do not. Children who are involved in the abacus tend to have a better understanding of numbers, higher calculation speed, and

improvements in concentration and memory compared to those who do not participate in this program.

To keep children interested while learning the abacus, several steps can be taken, including making learning more enjoyable through games, applying varied methods, giving praise or rewards, involving them in group activities, and adjusting the material to each child's ability level.

The school's support for this abacus program is quite significant, especially in providing the necessary facilities and resources. Schools generally provide suitable spaces for extracurricular activities, adequate abacus tools, and trained instructors. In addition, the school also supports this program by providing sufficient time in the children's activity schedule and monitoring the participants' development.

The abacus teacher and the class teacher coordinate with each other so that the material taught in extracurricular activities supports the lessons in class. They share information about children's development, apply consistent teaching strategies, and connect the concept of abacus counting with classroom mathematics learning.

Abacus extracurricular activities are usually held regularly, such as once a week every Thursday, depending on the school's policy. The teaching method is generally interactive, using an abacus to help children understand counting concepts. The teacher provides age-appropriate exercises and often incorporates games or fun activities to maintain the children's interest and motivation.

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Based on the data, it can be concluded that the abacus has a close relationship with arithmetic ability, supported by the teacher's knowledge and skills in delivering abacus material. With proper implementation, the abacus extracurricular program can have a positive impact on effectively optimizing children's arithmetic skills.

The initial concept of using the abacus begins with introducing each part of the abacus along with its different functions. The beads on the abacus serve as a tool for manipulating values in calculations, where the lower beads are worth one, while the upper beads are worth five. The use of this abacus not only helps improve children's cognitive abilities in counting but also trains fine motor skills through balanced finger movements.

Based on the research findings, it was found that RA Depag 1 has long implemented the use of the abacus as part of extracurricular activities following a discussion with the parents. This extracurricular abacus program is designed to optimize children's abilities, particularly in arithmetic skills. The abacus is a traditional counting tool commonly used in Japan and China. In the form of a rectangular box divided into two parts, top and

bottom, with beads worth one on the bottom part [6]. The introduction to the abacus begins in the first semester of the new academic year, with the aim of helping children understand how to use the abacus as a counting aid.

That the abacus is a simple counting tool used to explain the place value of digits in numbers and can also be used for arithmetic operations, such as addition and subtraction [6]. Children who participate in the abacus program show better counting skills, stronger number comprehension, and improved concentration and memory compared to those who do not participate. To keep abacus learning engaging, it can be done by creating a pleasant learning atmosphere, using varied methods, giving praise or rewards, involving group activities, and adjusting the material according to the child's abilities.

CONCLUSION

Fundamental Finding : This study underscores the effectiveness of the abacus as an educational tool in enhancing early childhood cognitive development, particularly in arithmetic skills. Children who engaged in abacus extracurricular activities displayed significant improvement in logical thinking, problem-solving, fine motor skills, and concentration. The hands-on, interactive nature of the abacus facilitates a balanced stimulation of both brain hemispheres, optimizing children's cognitive potential. **Implication :** The findings suggest that incorporating abacus activities into early childhood education curricula can provide a robust foundation for mathematical comprehension and cognitive development. It also highlights the importance of innovative, engaging teaching methods in fostering a deeper understanding of mathematical concepts while enhancing motor and mental coordination. **Limitation :** The study was limited to one educational institution and a small sample size, which may not fully represent broader populations. Additionally, the focus was primarily on short-term outcomes, leaving the long-term effects of abacus learning on children's cognitive development unexplored. **Future Research :** Future studies should expand the sample size and include diverse educational settings to generalize findings. Longitudinal research could examine the sustained impact of abacus learning on cognitive and academic performance. Further exploration into how abacus teaching can be integrated with other educational technologies could also provide valuable insights into modernizing early childhood education.

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